

The health units should have the opportunity of and interest in visiting the villages in their area of operation and in serving them, as well. For instance for health education and immunization Mobile Health Teams should be organized in each health unit.

The costs of this programme can be roughly estimated as

#### Capital costs

8 new units  $8 \times 3$  mill Afs = 24 mill Afs

#### Recurrent costs

|                          |                                |                         |
|--------------------------|--------------------------------|-------------------------|
| personnel                | $60 \times 0,02$ mill Afs/year | = 1,2 mill Afs/year     |
| 2 jeeps                  |                                | 0,3 "                   |
| air transportation fares |                                | 0,2 "                   |
|                          |                                | <hr/> 1,7 mill Afs/year |
| drugs unestimated        |                                |                         |

### 3.3

#### Mobile health Teams

Each health unit should have some funds for a few horses or donkeys to enable regular visits to the nearby villages without roads. The staff should also be paid more for such trips than for normal workdays, because of the trouble and inconveniences during those trips.

The aims of these trips should be

- to vaccinate the population of a selected area against TB every year
- to teach the women of a selected area the principles of delivery and child nutrition every year.

The Director of the Public Health Department in Badakhshan should co-ordinate these programmes so that the whole population selected for a specific period is treated. In the first phase the mobile health team should be formed from the ordinary personnel of the unit. For vaccinations two vaccinators and a nurse would be suitable.

For instructing women in deliveries and child care and for giving information on family planning, a team of two auxiliary nurse midwives and one nurse would be suitable.

After some years, as the health care personnel in the country has increased, the teams should be built up from the additional personnel assigned to the health units.

The estimated costs of the programme:

Recurrent costs:

- |   |                                                      |                   |
|---|------------------------------------------------------|-------------------|
| - | horse transportation costs                           | 0,1 mill Afs/year |
| - | drugs equipment and housing<br>from the health units |                   |

After establishing 12 teams:

Capital costs:

- |   |                                                   |              |
|---|---------------------------------------------------|--------------|
| - | housing of the new personnel<br>12 x 0,5 mill Afs | 6,0 mill Afs |
|---|---------------------------------------------------|--------------|

Recurrent costs:

- |   |                      |                   |
|---|----------------------|-------------------|
| - | personnel            | 0,7 mill Afs/year |
| - | horses and equipment | 0,2 mill Afs/year |
|   |                      | <hr/>             |
|   | drugs unestimated    | 0,9 mill Afs/year |

### 3.4

#### Health Posts

Because of the very difficult access to most Badakhshan villages and the little interaction between the villages and surrounding districts the village health worker system with health co-operatives seems to be most promising. Recommendations concerning this can be found in the report "Field Survey of Health Needs, Practises Recources in Rural Afghanistan".

The main idea is to have in each village one assigned person, who shall be responsible for the health activities in the village. This village health worker would be the most capable person selected by the villagers themselves. Gradually he would also get some training.

For buying the drugs villagers should build up co-operatives and the pharmacy could be managed by the village health worker.

The report here is only referred to and it is stressed that the training of the village health workers would be best organized in the nearest health centre or subcentre. This would be a big task for the health centres and subcentres. To begin with the development at once, pilot studies and the planning of the village health worker system and the worker's training should be begun in Badakhshan as soon as possible.

In spite of organizing costs no costs should be paid by the state as the health posts are supposed to be self-supporting.

## 3.5

Health education At the moment very little health education is given in schools, offices and administrative buildings. In the Afghan radio health programmes are produced. Plans for health education campaigns in Badakhshan should be designed and implemented according to the following guidelines.

In schools a few lessons per term should be held on hygiene, infectious diseases, food, water, sewage, refuse and nutrition.

For adults the same information should be given in advertisements in public places and over the Afghan radio. Also information on maternal and child care, delivery and family planning should be given.

The financial consequences of the implementation would be roughly:

Recurrent costs:

|   |                                      |                          |
|---|--------------------------------------|--------------------------|
| - | teachers' briefing 100 teachers/year | 0,3 mill Afs/year        |
| - | advertisements                       | 0,05 "                   |
|   |                                      | <hr/> 0,35 mill Afs/year |

## 3.6

Nutrition

The nutritional problems are of two kinds:

1. Child malnutrition, because of having too little protein in their food.  
It is suggested here that the WFP shall continue and enlarge its programme of delivering food to mothers and children. Vegetables should be grown on a larger scale in Badakhshan. (This is discussed in the sectoral report "Crop Production")
2. Stomach problems because of the unclean salt.  
People widely use salt instead of sugar even in their tea. This causes stomach ache because of the sylvine content and other impurities in the salt. The possibilities of purifying the salt or finding pure salt in Badakhshan has been discussed in another context (see sectoral report: "Geology")

## 3.7

Statistics and data

To see the effectiveness of health care programmes and get more information for the health care planning purposes, it is recommended that an information system be established. The following information should be collected every year:

- sex, age and main diagnosis of every patient visiting a health unit (30 most frequent diagnoses in Badakhshan in the WHO diagnosis system)

- sex, age and main diagnosis of every death case the same classes as above)
- number of deliveries
- number of vaccinations
- number of health education occasions and the number of people in the occasions
- estimated number of cases of
  - narcotic addicts
  - TB
  - Venereal diseases
- number of health personnel
  - amount of money spent on public health

The collection of this information should be done partly by

- health units
- the mobile units
- village health workers

the health units should be requested to send the mentioned data to the provincial hospital every year.

The planning work based on the data collected should be done partly (general planning) in the planning department of the Ministry of Public Health and the more detailed planning in the Department of Public Health in Faizabad.

Financial consequences of one more statistician in the central hospital would be approximately 0,02 mill Afs/year.

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## EDUCATION

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## EDUCATION

### 1. PRESENT SITUATION

#### 1.1 The system of schooling

The general schooling system of Afghanistan is applied in Badakhshan. Every child has to go to school at the age of 7, if this is possible. In Badakhshan it is considered possible within a distance of 5 kilometres from the school. Secondary and higher education is voluntary. All costs are paid by the government.

According to the school reform, which is now in progress and will continue for several more years the schooling system will be changed in the following way:

| <u>Present</u>                                                              | <u>Future</u>            |
|-----------------------------------------------------------------------------|--------------------------|
| Primary level 6 years<br>- Village school <sup>x)</sup><br>- Primary school | Primary school 8 years   |
| Middle school 3 years<br>Lycee (high school)<br>3 years                     |                          |
|                                                                             | Secondary school 4 years |
| Higher education                                                            | Higher education         |

x) Village schools are primary - level schools scattered throughout the villages usually with 1, 2 or 3 teachers and respectively 3, 4 or 5, 6 first grades of the primary school. After having passed the village school the pupils are supposed to continue their studies in the next grade of the nearest complete primary school.

The village schools will be built up to 8 grades. The two lowest grades of the middle schools will be incorporated with the present primary schools and the highest grade with the secondary schools.

The subjects taught in the present schools are, as follows:

|                                               |                 |                 |
|-----------------------------------------------|-----------------|-----------------|
| Religious studies, Khoran and Theology        | p <sup>1)</sup> | s <sup>2)</sup> |
| Ethics                                        | s               |                 |
| Logics (boys only)                            | s               |                 |
| Calligraphy                                   | p               |                 |
| National language (Pastu)                     | p               | s               |
| National language (Dari)                      |                 |                 |
| Arabic                                        | s               |                 |
| Foreign language (English)                    | s               |                 |
| Foreign language (French)                     | s               |                 |
| Foreign language (German)                     | s               |                 |
| Mathematics                                   | p               | s               |
| Science                                       | p               |                 |
| Health                                        | p               |                 |
| Chemistry                                     | s               |                 |
| Physics                                       | s               |                 |
| Biology                                       | s               |                 |
| Geology                                       | s               |                 |
| Social studies (History, Geography<br>Civics) | p               | s               |
| Economics (boys only)                         | s               |                 |
| Psychology (girls only)                       | s               |                 |
| Practical work                                |                 |                 |
| Knitting (girls only)                         | s               |                 |
| Needlework (girls only)                       | s               |                 |
| Home economics (girls only)                   | s               |                 |
| Physical education                            | p               | s               |

1) p = primary level

2) s = secondary (middle & lycee) level

According to the reform the main goals of the six first grades are to teach the pupils to read and write and count as well as to give religious and general education. During the next two grades some vocational subjects are also taught.

Teaching in the secondary school aims at providing a good base for higher education that is usually given in the universities and teachers' training colleges. According to the reform the amount of vocational training is small and will be increased at the secondary level.

At the moment the biggest problems of the whole system are:

- the over 90 % illiteracy of the total population
- the lack of trained technicians and middle level vocational training personnel
- academic under-employment; it is estimated that the posts of about 16 000 graduates do not correspond to their education

## 1.2

### Schooling in Badakhshan

Each school may be considered as an independant unit and responsible only to the Ministry of Education. The Office of the Director of Education Department in Faizabad takes care of co-ordination and control tasks.

The statistical Directorate in the Ministry of Education has all the necessary statistics of the schools in Badakhshan. It is only referred to here so that more detailed data can be found there.

The enrolment of primary-level schools in Badakhshan according to the sex of the pupils and the wolusvalis in 1974 may be seen in table 1.

This information cannot be considered very reliable. The figures also reflect the influence of transportation costs thus favouring lowland farmers. The seasonal prices of grain may include factors resulting from improper storage. The best prices are hardly offered for consignments which have suffered from storing. On the other hand the value of well-stored grain increases rapidly if a noticeable proportion of the grain offered by competitive farmers has weakened in quality.

## 2.5

Land prices

Referring to the above mentioned (RDP) report, cultivated land has been sold at the following prices (Afs per 0,2 hectares):

| Place                     | 1st class | 2nd class | 3rd class |
|---------------------------|-----------|-----------|-----------|
| Darwaz                    |           | 60 000    |           |
| Baharak                   | 25 000    | 20 000    | 15 000    |
| Urgo and Drime (Fayzabad) |           | 10 000    |           |
| Keranomenjan              | 15 000    | 10 000    | 5 000     |
| Eshkashem                 | 10 000    | 7 000     | 5 000     |
| Wakhan                    |           | 5 000     |           |
| Sheghnan                  | 5 000     | 4 000     | 3 000     |

## 2.6

Transport costs

In the RDP interview report from 1974 transport costs and mail transport times are indicated for the different parts of the Province. Transportation is especially difficult in the northern half of the Province, where there are no motorable roads in the direction of Khwahan, Darwaz and Sheghnan.

| Place          | Transport costs<br>from Fayzabad<br>(Afs per 7 kilos) |                       | Transport costs for<br>specified sections<br>(Afs per 7 kilos) |
|----------------|-------------------------------------------------------|-----------------------|----------------------------------------------------------------|
| Keshem         | 4-10                                                  | Keshem-Qataghan areas | 4-10                                                           |
| Eshkashem      | 5-10                                                  | Eshkashem-Wakhan      | 5-10                                                           |
|                |                                                       | Eshkashem-Sheghnan    | 25                                                             |
| Jurm           | 10                                                    | Jurm-Keranomenjan     | 70                                                             |
| Hazarat Sayeed | 13                                                    |                       |                                                                |
| Nassi (Darwaz) | 50-60                                                 |                       |                                                                |

TABLE 1

## THE ENROLLMENT IN PRIMARY LEVEL IN BADAKHSAN IN 1974

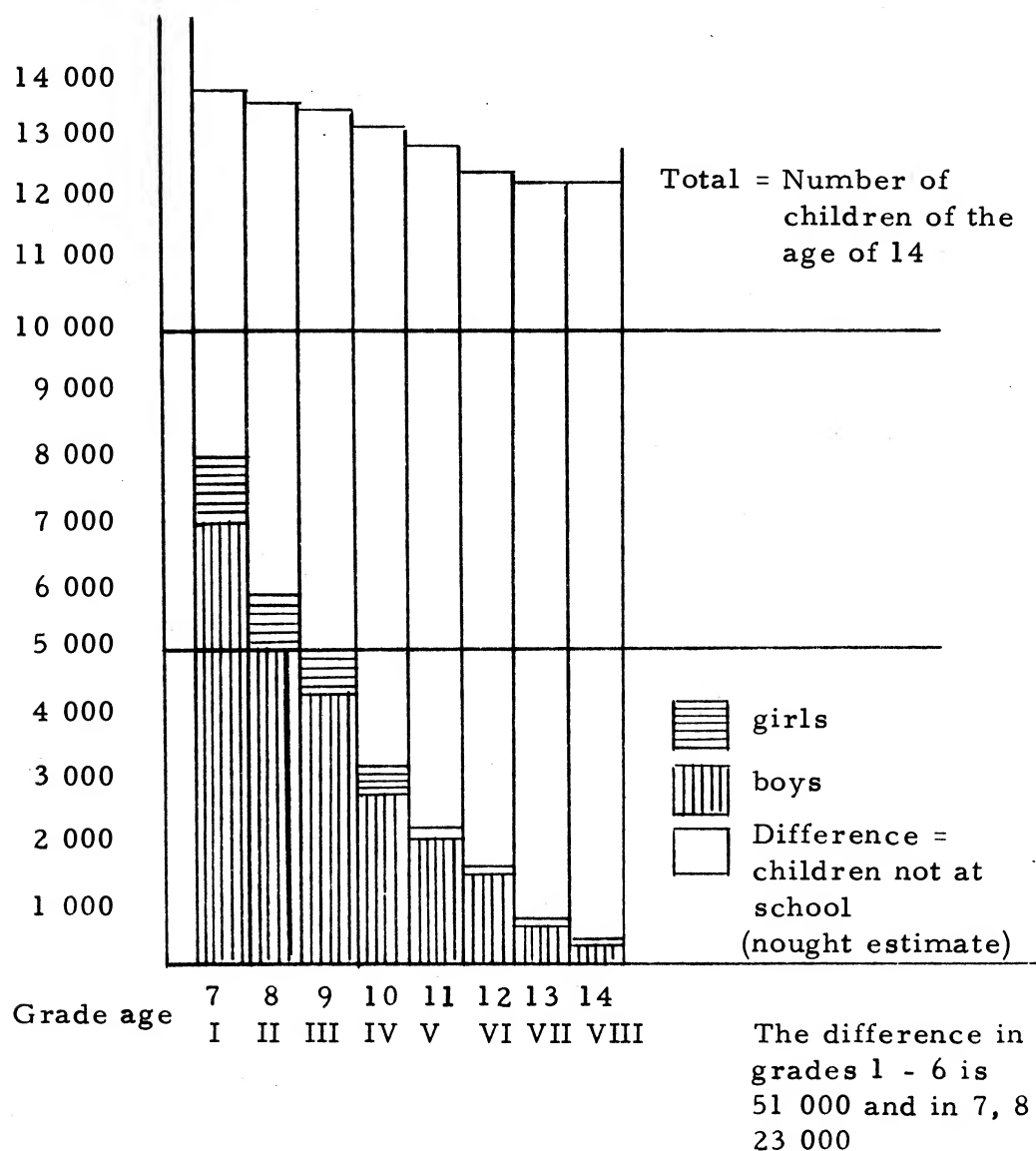
|                       | Village schools |       |       | Complete primary schools |       |       | Total present primary level |       |       | Middle schools grades 7 + 8 |       |       | Total primary level according to the reform |       |       | children of 7-14 |
|-----------------------|-----------------|-------|-------|--------------------------|-------|-------|-----------------------------|-------|-------|-----------------------------|-------|-------|---------------------------------------------|-------|-------|------------------|
|                       | boys            | girls | total | boys                     | girls | total | boys                        | girls | total | boys                        | girls | total | boys                                        | girls | total |                  |
| Faizabad              | 4338            | 61    | 4399  | 3871                     | 480   | 4351  | 8209                        | 541   | 8750  | 324                         | 71    | 395   | 8533                                        | 612   | 9145  | 46500            |
| Darwaz                | 1568            | 358   | 1926  | 1688                     | -     | 1688  | 3256                        | 358   | 3614  | 196                         | -     | 196   | 3452                                        | 358   | 3810  | 12900            |
| Jurm                  | 1703            | 488   | 2191  | 3433                     | 380   | 3864  | 5186                        | 868   | 6054  | 398                         | -     | 398   | 5584                                        | 868   | 6452  | 20900            |
| Eshkashem             | 583             | 557   | 1140  | 1466                     | 527   | 1993  | 2049                        | 1084  | 3133  | 133                         | -     | 133   | 2182                                        | 1084  | 3266  | 6600             |
| Keshem                | 1801            | 360   | 2061  | 2039                     | 204   | 2243  | 3740                        | 564   | 4304  | 221                         | -     | 221   | 3961                                        | 564   | 4525  | 11600            |
| Wakhan                | 145             | 35    | 180   | 87                       | 65    | 152   | 232                         | 100   | 332   | -                           | -     | -     | 332                                         | 100   | 332   | 2500             |
| Total Badakhshan      | 10038           | 1859  | 11897 | 12634                    | 1660  | 14294 | 22672                       | 3515  | 26197 | 1272                        | 71    | 1343  | 23944                                       | 3586  | 27530 | 100900           |
| The number of schools |                 |       | 159   |                          |       | 43    |                             |       | 202   |                             |       | 14    |                                             |       | 202   |                  |

At the same time the structure of the children attending the school by grade is shown in the figure 2.

**Figure 2** The present enrolment in primary level Badakhshan and the respective age distribution of children<sup>x)</sup>

Enrolment:

Number of children



x) The age of the children of each grade in the present schools varies greatly because the children begin school at different ages and also because of the varying amount of repeaters.

The reasons for non-attendance and leaving the schools during the first years are:

- after having passed the village school in 3 - 5 years the distances to the primary school are long
- the children reach working age early and in many cases poor families cannot afford to send their children to school

The number of teachers in 1973 was 201 in the village schools and 342 in the primary schools. Enrolment in the secondary level in 1974 was:

Table 3

| Woluswali      | Middle school |       |       | Present lycees |       |       | Total future secondary schools |       |       |
|----------------|---------------|-------|-------|----------------|-------|-------|--------------------------------|-------|-------|
|                | boys          | girls | total | boys           | girls | total | boys                           | girls | total |
| Faizabad       | 84            | 16    | 103   | 202            | 60    | 262   | 289                            | 76    | 365   |
| Darwaz         | 82            | -     | 82    | -              | -     | -     | 82                             | -     | 82    |
| Jurm           | 110           | -     | 110   | 136            | -     | 136   | 146                            | -     | 146   |
| Eshkashem      | 69            | -     | 69    | 122            | -     | 122   | 191                            | -     | 191   |
| Keshem         | 78            | -     | 78    | 140            | -     | 140   | 218                            | -     | 218   |
| Wakhan         | -             | -     | -     | -              | -     | -     | -                              | -     | -     |
| Total          | 426           | 16    | 442   | 600            | 60    | 660   | 1026                           | 76    | 1102  |
| No. of schools | 14<br>(8+6)   |       |       |                |       |       |                                |       |       |

The number of teachers in the middle schools in 1973 was 63 and in the lycees 35. One of the lycees in Faizabad is a boarding school with an enrolment of 117 boarding pupils in 1973. Besides the schools mentioned above there is one private vocational school for carpet weaving in Faizabad with an enrolment of about 50 boys a year.

The levels of teachers training in 1973 can be seen in the table 4.

Table 4

| Degree grade, years of education           | Number of teachers |
|--------------------------------------------|--------------------|
| Bachelor of Science                        | 8                  |
| Higher Teachers' Training College (13, 14) | 37                 |
| Bacalaureate (12)                          | 95                 |
| Teachers' Training College (9, 10, 12)     | 353                |
| Middle school (9)                          | 42                 |
| Grade (6)                                  | 39                 |
| Other education                            | 89                 |
| Total                                      | 663                |

According to the school authorities in Faizabad about 20 - 30 graduates per year leave Badakhshan to get higher education in the universities or teachers' training colleges, elsewhere in the country. The rest of the graduates are employed as merchants, clerks etc.

The biggest problems that the present schools are facing result from the lack of stationary and equipment. The school buildings in Badakhshan are usually built by the people as self-help with only the materials provided by the government.

There are no courses for adults to learn literacy as in some other provinces.

Many professions are learned at home. For instance farmers and handicraft workers pass on their skills from father to son. In the 7-years-plan for 1976 - 1982 the goals are to increase the total enrolment in schools by 50 % by building new classes and having new teachers in Badakhshan.

### 1.3

#### Educational Objectives

The very high illiteracy rate results in great difficulties in the distribution of information and skills. The main objective of educational planning is to reduce this high illiteracy rate, which is reported to be 90 - 95 percent at present.

As a rough estimate figure 2 shows that if all the children in the primary level were educated for six years, the present enrolment would increase from 26 000 to 77 000 pupils. In the reformed system the increase would be from 27 500 to 100 900. Taking the repeaters into account the increased is even bigger. The population increase results in about 2, 3 % more children of school age every year.

Estimates of the need for adult courses are more difficult to make. When beginning the planning of adult training, surveys of the need should be made.

At secondary level there is no urgent need to increase enrolment. On the contrary the small percentage of students continuing their studies further, academic under-employment, the lack of professional post-graduate training and the small use of secondary level education in practice show that the present enrolment in secondary level is at least satisfactory.

In vocational training the objectives in Badakhshan depend on the present and future professional structure of the population. The need to increase the skills and knowledge of new methods in farming and livestock is important.

The need for trained personnel in other branches is and will be so small during the next few years that it is more economical to centralize such training in Kunduz or even in Kabul.

The highest education is centralized in the biggest cities of the country. It is only mentioned here that in order to serve talented pupils from the remote provinces, these schools and universities should also have good studying facilities, similar to boarding schools in the future.

## 2. GENERAL OBJECTIVES AND GUIDELINES

The general objective of educational development should be to satisfy the main educational needs in Badakhshan with the lowest possible need for resources. First priority is given to the following main problems:

1. To increase the rate of literacy and in the long run to make the whole adult population permanently literate.
2. As women have a very great role to play in educating the next generation, equal possibilities of obtaining education should be provided for girls as well as boys.

3. The professional skills of the farming population should be increased so that the quality and the quantity of production may be increased by increasing productivity.

### 3. DEVELOPMENT PROGRAMME

#### 3.1 Census

At the moment there is no reliable information available on the number of children of school age in different districts. The lack of this information prevents exact educational planning.

The need for a census is only referred to here, because it is recommended in another part of the report.

#### 3.2 The new primary schools

It is recommended that in the next plans concerning primary level education in Badakhshan the following should be taken into account.

The school reform in Badakhshan should be transformed so that the primary level would be compulsory for the first six years and the last two years voluntary. This would save much money in terms of capital and recurrent costs and also the need for teachers would be smaller.

The present need of resources to increase enrolment from 26 000 to 77 000 in the primary schools can only be roughly estimated. This estimate is very rough and the following factors also influence the planning of the resources for this enrolment:

- time schedule - for instance in 15 years the need for primary education increases by 50 % because of the increase of the population
- the pupil per teacher ratio used here is 50
- the possibility of working in two shifts. At the moment this is done in 10 schools in Badakhshan and it is assumed that it could be done in 20 % of the schools.
- the high rate of repeaters increases the need and this rate should be reduced to 5 %
- the possibility of teaching in the open air or using mosques, tearooms and other public buildings as temporary classrooms is not taken into account here.

To achieve the target of having all the children attend school for six years for instance by 1990 the following resource need can be calculated:

Present schools working as they are at present

New enrolment

$$77\ 000 \times 1,5 \times \frac{1}{0,95} - 26\ 000 = 86\ 000$$

Capital costs:

Investments in classrooms and equipment

$$1\ 700 \times \left(\frac{1}{1,20}\right) = 1\ 400 \text{ a } 170\ 000 \text{ Afs} = 240 \text{ mill Afs} =$$

$$\underline{16 \text{ mill Afs/year}}$$

Current costs:

$$\text{costs for new teachers } 1\ 700 = 34 \text{ mill Afs/year}$$

$$\begin{array}{l} \text{costs for stationary, textbooks etc.} \\ 1\ 700 \times 1\ 300 \text{ Afs/class/year} \end{array} = \underline{2 \text{ mill Afs/year}}$$

$$36 \text{ mill Afs/year}$$

The scheduling of this kind of programme as well as the location of the new schools can be carried out only after detailed further planning with more exact census information. Some indicative information on the lack of schools in each district can be seen in table 1. The most acute relative shortage of schools at the moment occurs in the Wakhan district.

All the new schools will be mixed ones and the present boys' schools will be gradually transformed to mixed ones. One half of the total enrolment will also be reserved for girls in the new mixed schools.

In grades 7 and 8 the enrolment will be kept at the present level.

### 3.3

#### Secondary schools

No building is recommended. Later on in the future as educational needs for this level increase, more secondary schools should be changed to boarding schools so that talented pupils living far from the schools would have an opportunity to study on this level.

## 3.4

Vocational training

The establishment of a vocational school is not recommended at the moment. To increase the skills of the farmers the establishment of model farms is recommended. This has been discussed in the technical reports of "Crop Production" and "Livestock and animal husbandry".

A feasibility study should be carried out to see if the training of nurses and auxiliary nurse midwives can be started in the provincial hospital of Faizabad to increase the number of health personnel in the province. This can be carried out by the personnel of the provincial hospital and with the help of one health personnel training expert.

## 3.5

Curriculum changes

Planning should be started to change the curricula in grades 5, 6, 7 and 8 in primary education. New subjects of crop production and animal husbandry should be included. In agricultural items, modern methods, use of fertilizers, animal feeding and sheep cutting should be introduced.

In the planning of curriculum changes the following factors should be taken into account:

- introduction of agricultural knowledge useful in Badakhshan at present and over the next 10-15 years
- possibilities of arranging pilot studies in the fields surrounding the schools, for instance in the use of fertilizers and irrigation.
- changes in teacher training

Short courses of simple mineralogy should be included in the primary education curriculum to encourage the search for minerals and ores.

## 3.6

Adult training

Planning of adult training in Badakhshan should be started soon. The adult training programme should include the following items:

- literacy courses held by the primary school teachers
- providing the schools with a library of about 200 volumes, 2 - 3 newspapers and a radio.

According to this programme the schools should also serve as community centres.

It is estimated that the planning of the adult training programme would demand 10 man months of a team consisting of

- 1 - 2 teachers training experts
- 1 - 2 economists.

The implementation of the plan in Badakhshan would require approximately 5 years. The costs of providing 100 schools per year with 200 books and a radio would amount to about 2,6 mill Afs/year.

# TRANSPORT AND COMMUNICATIONS

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### 3. RESEARCH AND EXTENSION

#### 3.1 Research

Activities in the field of agricultural research and extension are centralized at the department of Research and Extension, a division of the Ministry of Agriculture and Irrigation. The research organization has five branches including soil research, crop research for cereals, industrial and horticultural crops, plant protection research and livestock research. About twelve major agricultural research stations support the agricultural programme of the country.

Baghlan research station, (Puz-i-Shan) with about 100 hectares of fields, is located outside Baghlan. It is a regional centre for agricultural and livestock research. Crop research was limited to cotton and sugar-beet at the beginning of the operation. Recently rice, wheat, corn, sunflower, fruits and vegetables have been additional subjects of study. Dryland experimental work on wheat, barley and pasture is carried out at the Baisakal substation 15 kilometres north of Baghlan.

The Baghlan station includes the training centre and livestock clinic with insemination centre, at present operated and upgraded with the help of the United Nations Special Fund for Animal Husbandry Training and Demonstration Project. The Agricultural High School at Baghlan has also gone into operation.

Baghlan is a development centre for the PACCA project (United Nations Programme on Agricultural Credit and Cooperatives in Afghanistan).

Selected parts of the organization chart of the Afghan Ministry of

Agriculture and Irrigation:

Minister

Deputy Minister

Eight Presidents of sections

Departments:

Planning and statistics  
Irrigation and engineering  
Research and extension  
Water and soil  
Plant protection

Forestry  
Veterinary and animal husbandry  
Irrigation construction  
Regional agriculture (i.a. Badakhshan)  
Nangahar Valley development project

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#### ABBREVIATIONS

|            |                              |
|------------|------------------------------|
| P. W. D    | Public Works Department      |
| R. D. D    | Rural Development Department |
| A. D. T    | Average Daily traffic        |
| A. D. T. U | Average Daily Truck Unit     |

## TRANSPORT AND COMMUNICATIONS

### 1.

#### INTRODUCTION

In this study the field of transport and communication is dealt with separately in the road-, air- and telecommunication sectors. Only the road transport sector has been analyzed in detail. The other sectors are discussed only briefly referring to discussions with the representatives of the institutions in charge. It must be stressed that the information given below is based partly on sources, the reliability of which could not be verified within the short period of survey execution.

The economic activities in the Province that create interaction between other neighbouring areas are at present modest in respect of quantity. The transport of goods from and into the region relies entirely on road transport. In passenger traffic air transport accounts for a significant part of the inter-regional traffic.

The topography of the Province is mountainous or hilly and cut by a large number of streams and gorges. The Province is as a whole badly isolated from the rest of the country due to very rough road conditions. The climatological conditions in winter also restrain flight operations so that the Province can be totally cut from connections with other parts of the country for several days. Moreover, there are motorable roads only in the Kokcha River valley system with tributaries and along the Amu Darya valley in Wakhan. Thus the major part of the region can be reached only on foot or on horseback.

The telephone network is extended to the subcentres of the Province. However, connections are very unreliable due to modest technical facilities.

The difficult conditions for the transport of goods raise the transport charges to a high level which hampers economic growth. In the remote parts of the Province costs of different consumer goods can be the double compared to Kabul prices.

## 2. ROAD TRANSPORT

### 2.1

#### Present condition

##### 2.1.1

#### Organization and Equipment

The Public Works Department (P.W.D.) is responsible for the supervision, maintenance and construction of roads. Also the Rural Development Department (R.D.D.) implements and supervises minor construction work concerning road structures (culverts, bridges etc.)

There are presently 80 labourers and 10 office workers employed within the P.W.D. The director of the department also acts as head of the municipality of Faizabad.

The maintenance of roads and structures depends to a large extent on self-help labour. There is one road supervisor nominated for each 50 km. of main road. For temporary use there are base camps for labour groups. The condition of the camps is reported to be very poor.

The available equipment for the Public Works Department comprises the following:

- 2 trucks
- 1 bulldozer
- 1 grader

Labour costs are reported to average 50 Afs/manday. A system is also applied where food compensation is given for labour input. The equivalent has been of the order 25 Afs/day.

The projects implemented by R.D.D. have been designed in line with the objective that they can be constructed using simple methods and hand tools. Labour will consist mainly of unskilled village workers who will also thus obtain new construction skills.

The organization of road maintenance is in principle adequate. However, lack of transport means and light construction equipment constitute heavy obstacles to operations. The division of responsibilities between R.D.D. and P.W.D. is not clearly defined in practice. For instance, World Food Programme Funds were routed to improvements of the mainroad by R.D.D., because the capacity of P.W.D. was insufficient at the time.

## 2.1.2

Road Inventory Road classification: The road network classification has been defined from a technical point of view in the highway maintenance programme (ref. 2, 3) and is shown in Appendix 1.

The above classification applied on roads in Badakhshan gives the following rough distribution figures:

Table 1: Motorable roads in Badakhshan (estimate based on local interviews and field trip reports)

| Road Type  | Road Link               | Length<br>km | Total<br>km |
|------------|-------------------------|--------------|-------------|
| C road     | Faizabad - Westwards    | 20           | 20          |
| -----      |                         |              |             |
| D road     | Keshem - Faizabad       | 85           |             |
|            | Deshem - Pahte Naron    | 55           |             |
|            | Faizabad - Eshkashem    | 150          |             |
|            | Eshkashem - Qala-i-Panj | 120          |             |
|            | Main road - Zebak       | 7            |             |
|            | Main road - Jurm        | 22           |             |
|            | Jurm - Gauhar           | 60           | 500         |
| -----      |                         |              |             |
| Seasonally | Faizabad - Urgo         | 150          |             |
| Motorable  | Baharak - Chehitan      |              |             |
| track      | Baharak - Sarghailan    |              | 150         |
| Total      |                         |              | 670 km      |

In addition to the roads mentioned in Table 1 there are about 1 500 km main horse tracks. These tracks serve as feeder connections to most rural villages.

The condition of the motorable roads (670 km) is extremely rough in general partly due to insufficient maintenance operations. Most frequent road damage and types of deteriorations are:

- Water erosion on slopes. The temporary water-flow crosses the road eroding the structure where no protective structures have been constructed. In many cases the road alignment must be shifted temporarily. The damage applies to all motorable roads.
- Deterioration of the road base due to heavy traffic units. The road base material is silty and/or clayey and water logging or infiltration occurs.

This type of deterioration is especially frequent in irrigated areas.

- The dusting off and washing off of binder fractions in the surface material. When the surface material is no longer bound deterioration accelerates and as the next phase the road base is exposed for direct abrasion.
- Minor earthslides and rockfalls occur frequently where slope cuttings are too steep and no protective structures are constructed. The road can be thus closed for several days. The risk of larger earthslides is apparent at some places along the Kokcha River Valley.
- Several wash and stream crossing wadis where no permanent structures (e.g. concrete) have been constructed at sites where the road is blocked frequently during rainy seasons.

The average driving speed on motorable roads is less than 25 km/hour with the exception of some stretches along the Faizabad - Keshem main road. The bridges are wooden structures with the exception of Keshem River Bridge and the bridges at Faizabad town which are constructed of reinforced concrete and steel. One minor reinforced concrete bridge (L = 8 m) was under construction at Chokaron, 10 km east of Baharak. Three more were to be constructed by R.D.D. during the present construction period. A major bridge work was under construction at Faizabad town.

The wash crossings are, with the exception of five saddle bridges near Faizabad "not constructed" and the road alignment will thus be "flexible" following the terrain according to prevailing conditions.

Traffic operations become risky at several road sections on steep hill sides where the carriageway width is reduced by erosion. Severe accidents with deaths were reported to occur annually.

The motorable roads and main horsetracks are shown in Appendix 2.

## 2.2

### Traffic characteristics

Road traffic volumes on motorable roads are modest in quantity. In the 1971 traffic counts the average daily traffic (A.D.T.) comprised on the road link Keshem - Faizabad about 35 vehicles. Twenty five average daily truck units (A.D.T.U.) were recorded. The remaining 10 were buses and cars. During the field trip

(oct. 1975) observations indicated traffic volumes of the same order. On the section Faizabad - Baharak traffic volumes were approximately 10 (A.D.T) and on the rest of the motorable road network less than 10 (A.D.T.).

In the survey (ref.10) of the mainroad Kunduz - Faizabad it was estimated that the goods flow on Keshem - Faizabad section was of the order 40 000 ton in 1970.

The forecast up to 1990 indicates a growth of up to 110 000 ton/year. These estimates must, however, be regarded as very rough, indicating only the approximate magnitude. The breakdown by type of goods transported is estimated as follows:

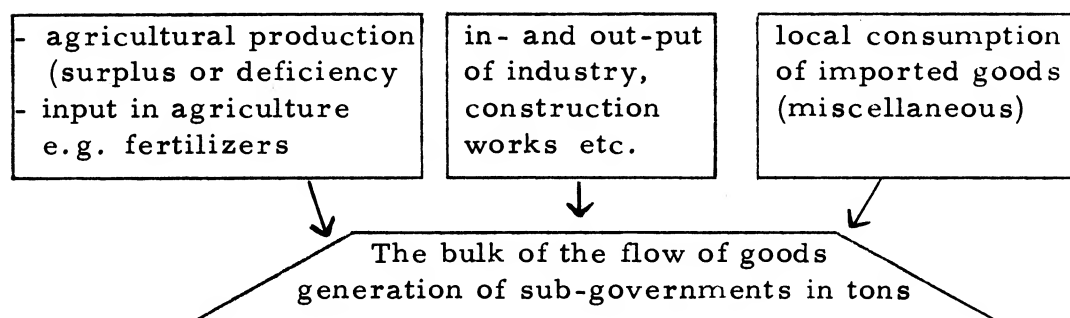
Table 2: Estimation of goods transport on Keshem - Faizabad Main Road 1990 (ref. 10)

| <u>Item</u>           | <u>%</u> | <u>Tone</u> |
|-----------------------|----------|-------------|
| Agricultural products | 55       | 60 000      |
| Fertilizers           | 15       | 16 500      |
| Building mat.         |          |             |
| Machines, Equipment   | 14       | 15 500      |
| Miscellaneous         | 16       | 18 000      |
| <hr/>                 |          |             |
| Total                 | 100 %    | 110 000 ton |

Lack of a recent agricultural census makes the estimation of the present and future flow of goods unreliable. The traffic forecasts must, however, be regarded only as a supplement to the information basis when justification for separate road improvement projects are being assessed.

To give an overall picture of the provincial transport demand the following outline could be applied once basic information is available:

(separately for each sub-government)



## 2.3

Feasibility of road-construction and maintenance  
(theoretical)

In this context road-construction, improvement works and maintenance are discussed only regarding gravel and earth surface roads. The following calculations on average unit costs, economic benefits and average performance of equipment are based mainly on information obtained from the highway maintenance study (ref. 2, 3)

The maintenance operations can be defined as comprising the following main tasks:

1. Maintenance of the pavement (surface) of the carriage-way
2. Maintenance of shoulders, ditches and slopes
3. Maintenance of structures (bridges, culverts, retaining walls etc.)
4. Maintenance of protective structures outside the road
5. Repair and clearing after land slides
6. Clearing after snowfall

In order to ease the organization of maintenance operations as well as estimation of fund and equipment allocation, the work can be outlined as follows:

1. Routine maintenance to be carried out "daily"
2. Periodic maintenance
3. Improvement work
4. Emergency maintenance
5. Repair, replacement of structures

The above division in work categories applied on different road types (D, C and B<sub>2</sub> see Chap. 2.1.2 App. 1) gives the following specifications.

Routine Maintenance

B<sub>2</sub> roads Permanent crew (1 foreman, 15 - 20 labourers, hand tools and flat bottom truck) for each 50 km to be maintained. Loader available when needed.

Grading monthly, average 7 hours/km/year at  
ADT 50 - 100, 11 hours/km/year at ADT 100 - 200

C roads      Permanent crew (see above) for each 75 km to be maintained  
Grading 2/year

D roads      Permanent crew for each 100 km  
Grading when equipment available

### Periodic Maintenance

B roads      Selected gravel supply annually according to ADT (e.g. ADT 50-100, gravel supply 25 m<sup>3</sup>/km/annual see appendix 3)

C and D roads      No periodic maintenance needed. Permanent crews supply material when needed.

### Betterment works

B, C, D roads      The work comprises resurfacing and improving of road base courses when the upper layers have severely deteriorated. Supply of surface dressing at steep gradients. Trained labour needed.

### Emergency Maintenance

B, C, D roads      Clearing after landslides, snow blocks etc. A state of readiness with sufficient pools with equipment needed provincially.

### Repair Replacement of Structures

B, C, D roads      The work comprises construction work that in many cases requires input of skilled labour (concrete work, masonry etc.)

The stage construction and maintenance constitute operations that cannot be dissociated. This can be formulated as follows:

Maintenance aims at preserving the road from deteriorating stage-wise to such an extent that subsequent improvements would not be meaningful on the existing road base without essential new construction.

The average unit costs for different operations at 1972 price level are given in Table 5. Based on these unit costs, the average costs for improvements to a certain standard of gravel road, have been estimated for "typical roads" and are as follows (ref. 3)  
The figures must be regarded as rough estimates only.

**Table 3** Average costs for improvements of gravel roads  
price level 1972 cost in 1 000 Afs/km (ref. 2, 3)

| Imp.<br>Level  | Total<br>Costs | Labour                           | Material | Equipment | Total |
|----------------|----------------|----------------------------------|----------|-----------|-------|
|                | 1000 Afs       | Distribution in percent of total |          |           |       |
| B <sub>1</sub> | 887            | 16%                              | 27%      | 57%       | 100%  |
| B <sub>2</sub> | 243            | 25%                              | 13%      | 62%       | 100%  |
| C              | 196            | 35%                              | 14%      | 57%       | 100%  |
| D              | 68             | 54%                              | 6%       | 40%       | 100%  |

When considering the justification of separate road improvement projects the following benefits should be considered:

- a) expected economic growth due to improved transportation facilities
- b) direct savings in vehicle operating costs
- c) improved safety of traffic operations
- d) improved reliability of transport services

In the Highway maintenance study the benefit/cost ratio has been calculated based on the b) point savings. The approach is not comprehensive and results must thus be regarded only as indications. The economically justified opening year traffic according to different improvement levels is presented below:

**Table 4** Economic opening year traffic based on savings of vehicle operating costs (ref. 3)

| Present Road<br>standard | Improvement<br>level | Opening year<br>ADTU |
|--------------------------|----------------------|----------------------|
| Track                    | D                    | 20                   |
| D road                   | C                    | 75                   |
| C road                   | B <sub>2</sub>       | 160                  |
| B <sub>2</sub> road      | B <sub>1</sub>       | 400                  |

The economic justification of maintenance has also been calculated based on a similar approach. The benefit/cost ratio exceeds 1,0 at traffic volumes 20 ADTU even for maintaining existing tracks.

The maintenance costs for different road standards are dependent on traffic volumes. Detailed cost estimates are given in Appendix 3. For ADTU 50 the average cost estimates are as follows:

Table 5 Average maintenance costs ADTU 50 price level 1972

| Road Type | Maintenance Cost |             |                   |
|-----------|------------------|-------------|-------------------|
| B2 roads  | 14 000           | Afs/km/year |                   |
| C roads   | 11 000           | "           | ADTU $\approx$ 50 |
| D roads   | 5 000            | "           |                   |

## 2.4

### Development Objectives and Priorities

The provincial transport demand will for the major part be met by the use of pack horses and donkeys also in the near future (5 - 10 years). This implies that road construction projects should be carefully studied as a problem of flexible stage construction. The alignment of roads to be constructed or tracks to be improved should be analyzed from the point of view that the final motorable road with permanent structures can be gradually constructed effectively utilizing existing horse track structures. Of special importance is the choice of alignment near river, gorge and wash crossings.

The main road up to Faizabad is the economic artery of the province. As long as conditions remain in the present rough shape economic interaction with other parts of the country is severely restricted. This implies that the construction of this road should to have the highest priority within the transport sector. Plans prepared earlier should be scrutinized in order to state the need for additional surveys to fix the alignment of the road.

The construction of new roads and permanent structures must be balanced to correspond with the maintenance capacity. The present unsatisfactory state of most motorable roads is a result of insufficient maintenance operations. Most roads can be improved gradually within the scope of maintenance. To improve the readiness and capacity of road maintenance a rise in

|                             |                                              |
|-----------------------------|----------------------------------------------|
| Research division:          | Water and soil department:                   |
| Cereal crops                | General hydrology, four provincial divisions |
| Fisheries                   | Soil survey                                  |
| Cotton and industrial crops | Soils                                        |
| Horticulture                | Soil laboratory                              |
| Wheat improvement           | Soil survey                                  |
| Administration              | Topography                                   |
| Preparing of reports        | Underground water                            |
| Cooperatives and credits    |                                              |

#### Extension division:

Fertilizer  
Audio-visual

Machinery is included in the Irrigation and Engineering, Technical Division and Irrigation Construction Department. Survey work is included in Irrigation and Engineering, Water and Soil, Plant Protection, Nangahar Development, but not in Forestry Department activities.

### 3.2

#### Extension

The Afghan Extension service has advisory staff in the Badakhshan Province only in locations with road connection. Some supervisors and the provincial extension officer are university graduates.

| Minor Civil Division | Supervisors | Agents | Administrators |
|----------------------|-------------|--------|----------------|
| Fayzabad             | 1           | 4      | 1              |
| Jurm                 | 1           | 4      | 1              |
| Baharak              | 1           | 6      | 1              |
| Eshkashem            | 1           | 6      | 1              |
| Keshem               | 1           | 6      | 1              |
| Total                | 5           | 26     | 5              |

### 3.3

#### Agricultural training

The future farmers and advisors of Badakhshan can obtain training either at the vocational agricultural college of Badkhan, which is currently in its first term of operation, or at the corresponding institute in Darweshan. In the Faculty of Agronomy of Kabul University there are currently 600 students from various parts of the country. The staff comprises 68 Afghan teachers and lecturers, half of whom instruct students in their field work in the provinces.

recurrent funds and the allocation of equipment is urgently needed. The capacity can be extended stage-wise by establishing permanent crews with equipment for certain road-stretches. The need for heavy equipment such as graders, stone crushers etc. can be analyzed from a regional point of view to correspond with long term construction objectives. Also the workshop facilities must be improved accordingly.

While the topographical and climatological conditions are rough, the protective structures along the roads have a very special importance. In most cases suitable material is available for the construction of the structures in stone masonry or concrete. It is proposed that an overall inventory of critical sites be carried out in order to assess the actual need for construction work. It must also be stressed that these structures may significantly reduce the need for maintenance.

The isolation of the northern sub-governments is likely to continue for the next ten years unless very severe measures are taken. To improve accessibility to the remote areas a survey on the most suitable road alignment must be carried out. According to the results, stage-wise improvements should begin immediately and the highest priority be given to the construction of minor bridges and structures where water erosion is likely to cause damage on the route.

## 2.5

### Programmes and Project Proposals

#### 2.5.1

##### General

The definition of projects has been made within the frame work of the following categories in order to outline the development course as a whole

- a) Carry over projects. These are projects that are under construction
- b) Intensified maintenance
- c) Construction of new roads and essential improvements of existing roads
- d) Construction of structures (culverts, protection walls, retain walls, minor bridges etc.)
- e) Surveys on new roadlinks

The proposals do not constitute a fixed plan because neither fund estimates nor a time schedule for a desired level of services to be achieved was given as a plan guideline. It was, however,

suggested that the definition of separate projects should be given also in terms of economic input needed. The results are, however, to be regarded as rough estimates only and the economic feasibility should be examined in more detail in future planning stages.

### 2.5.2

#### Maintenance and Equipment

The motorable roads presently cover about 670 km. The average condition is poor also in respect of surface, base courses and structures (culverts bridges etc.). The major part of these roads can be classified as track or D road (see App. 1) in bad condition. Thus maintenance operations in the initial stage would consist of routine maintenance within which minor improvements can be implemented.

It is suggested that maintenance crews be established and equipped with one flat bottom truck and hand tools. One crew should be established for each 100 km of road to be maintained. The crew should consist of one foreman and e.g. 15 - 20 labourers. Base camps should be constructed for each crew. At a cost of 2 000 Afs/month for ordinary labour, 2 500 Afs for the foreman and 12 000 Afs/month for a truck with driver, total costs amount to 44 500 - 54 500 Afs/month and recurrent costs accordingly to 534 000 - 654 000 Afs/year which is equal to 5 300 - 6 500 Afs/km/year.

The crews should be established stage-wise according to funds available. The performance of the pilot crews should be analyzed in order to work out guidelines for the operation of the additional crews.

The lack of equipment for heavier earthwork, concrete work and base course and surface material production constitutes a severe bottleneck especially regarding construction of new roads and permanent structures. Most urgently needed are trucks for the proposed maintenance crews. The need for graders is estimated at 1 grader/200 km of roads to be graded.

The construction of roads in rocky areas cannot be properly done without drilling and blasting equipment. At present these facilities are lacking. Also the performance of concrete works is restricted because of a shortage of light concrete mixers and vibrators.

Based on interviews in the region and in view of the aspects presented above the following list of urgently needed equipment was prepared.

The list also indicates the tentative priority

1. Trucks for maintenance crews, 1 truck/100 km of road to be maintained
2. Equipment for a construction unit
  - Concrete mixer (light)
  - Compressor
  - Drilling and blasting equipment
  - Water pumps
  - Vibrators
3. Motorcycles for road supervisors
4. One additional grader for each 200 km of roads to be graded. Initial need one additional grader
5. One medium stone crusher

### 2.5.3

#### Road Construction and Betterment Projects

##### Carry over Projects:

At the time of the field trip (Oct. 1975) no essential road construction projects were in progress. Work on roads could be classified as maintenance operations. Funding was arranged from the World Food Programme and work supervised by R.D.D.

A major bridge over Kokcha River (L=45 m) was under construction at Faizabad town. Three pillars and the basements were already finished. The project was started in 1974, and total costs were estimated to be in the order of 2 milj. Afs. Technical assistance is needed for the supervision of the project. The time schedule for proceeding in the work was not fixed.

R.D.D. was conducting the construction of a minor reinforced concrete bridge (L=8m) at Chokaron. The cost estimate was reported to be 130 000 Afs. Work was to be completed during the construction season. Three more bridges were approved by R.D.D. and construction work was supposed to start before the winter. Cost estimates vary from 100 000 Afs to 250 000 Afs. R.D.D. was also conducting the construction work on several culvert works, which were reported to total 20 during the construction season.

##### New Construction and Improvement Projects:

Feeder Roads As stated before the construction of new motorable roads should be in line with the actual maintenance capacity. The stress should be put on the stage-wise improvement of the main tracks in the

areas north of Kokcha River. Structures (road as well as bridges retain wells etc.) should be constructed with a design that does not require essential input of skilled labour. Also the maintenance must be considered from the point of view that it is mostly dependent on self-help inputs.

R.D.D is responsible for the development of these feeder roads. As a rough cost estimate for the improvement of an existing horse track to a motorable standard D road 50 - 70 000 Afs/km can be used, which is equal to about 1 000 mandays/km. It must be stressed that site surveys must be carried out before implementation (see Chap. 2.5.4). The approximate unit costs for different kinds of construction work is estimated to be as follows (ref. 2, 3)

Table 6 Average unit costs for different construction works, price level 1972 (ref. 3)

| Work and Unit                        | Cost Afs. | Work and Unit                                                            | Cost Afs. |
|--------------------------------------|-----------|--------------------------------------------------------------------------|-----------|
| 1 manday unskilled labour            | 60        | 1 m <sup>3</sup> retaining wall, stones in dry pitching                  | 200       |
| 1 manday skilled labour              | 90        | 1 m <sup>3</sup> backfill selected mat. haulage 5 km                     | 127       |
| 1 grader day                         | 3750      | 1 m <sup>3</sup> excavation of ditch by grader                           | 9         |
| 1 m <sup>3</sup> reinforced concrete | 1140      | 1 m <sup>3</sup> subbase selected mat. watered compacted                 | 77        |
| 1 m <sup>3</sup> stone masonry       | 550       | 9-12 cm, 5 km haulage graded<br>1 m <sup>3</sup> base mech. stab. gravel | 157       |
| 1 m <sup>3</sup> mass concrete       | 726       | 10 km haulage, graded, watered compacted                                 |           |

#### Main road

The major road and bridge projects will be the construction of the main road Kunduz - Faizabad. At the time of the field trip this project was in full swing on the section Taluqan - Kunduz. Rough cost estimates were reported to be about 10 mill Afs/km including all structures. The alignment of the road is in the plan following the present road from Keshem to Faizabad. The existing structures cannot be utilized except to a minor extent. It was reported that after the road alignment surveys the Kokcha River had changed route at the site called Charakamar. Field inspections proved that the conditions had changed to such an extent that a new survey was needed at this site. It must also be stressed that

the Governor of the Province urged that a survey (see 2.5.4) on an alternative route Keshem - Faizabad should be carried out before a final decision is made. Although this major construction work is accelerated it will take about five years before the full benefit of the project can be obtained.

**Table 7** Proposed technical standard of the main road Kunduz - Faizabad (ref. 10)

| Variable           | Value  |
|--------------------|--------|
| Carriage-way width | 10 m   |
| Pavement           | 7 m    |
| Max Gradient       | 8 %    |
| R min. convex      | 3000 m |
| R min. concave     | 1500 m |
| R min. horizontal  | 60 m   |

#### Improvement of Motorable Roads

The stage-wise improvement of existing motorable roads (excluding Keshem - Faizabad Road) can be classified as improvement work from a poor D standard to adequate D standard. The average cost would thus be in the order of 70 000 Afs/km totaling about 40 mill Afs. Priority should be given to the main road Faizabad - Eshkashem the length of which is 150 km.

#### 2.4.4

##### Surveys

The analyses of the present conditions, the capacity of construction and maintenance as well as the proposed projects by local authorities constitute a basis for the following proposals for further surveys to be undertaken in the near future. The presentation below should be regarded only as a preliminary definition indicating the main objectives and giving rough estimates of resources needed. Detailed terms of references should be prepared within the next planning stage.

#### Survey on the Alternative Main Road Route Keshem - Faizabad

The local authorities have stressed the importance of this survey (fig. 1). By now a road site has been cleared along the stretch.

The standard of the alignment as well as the structures cannot be utilized for stage construction to a main road standard. The length, total about 70 km, is thus about 30 - 35 km shorter than the alternative route following the existing main road. As justification for a survey the following aspects may be considered:

- The completion of the main road up to Keshem from Taluqan will take several years. The survey will not therefore slow up the project as a whole.
- The site at Charakamar (on the existing route) must be resurveyed in order to check the solution in the plan already prepared (ref. 10)
- The shorter road alignment (30-35 km) up on the hills may need less bridges and wash crossing structures.
- The population density up on the hills is reported to be higher than in the Kokcha Valley. Also feeder road connections are reported to be easier to construct (linkage to the main road).

The survey could be outlined in two phases as follows:

1. Prefeasibility study on the topography and general soil conditions as well as the occurrence of suitable deposits of road construction material. As an outcome of this preliminary survey a decision can be made whether further investigations are needed.
2. If the outcome of the prefeasibility study shows that the alternative route might prove more economical than the already surveyed one, a master plan should be prepared so that final decision on the route alternatives can be made.

In the event that the prefeasibility study indicates that the more feasible route is the one along Kokcha River, then the information of the survey should be used as basis for a feeder road plan on the alternative route. This aspect should also be regarded when considering the justification of the survey. To complete both surveys the minimum time needed is estimated to be about 1,5 years. Technical assistance for this survey could be sought once detailed terms of references are prepared and cost estimates known.

#### Feeder Road Survey

This survey should be conducted mainly to find out the course of stage-construction of existing tracks to a motorable standard with special emphasis on the connections of the northern areas. The survey could be outlined as follows:

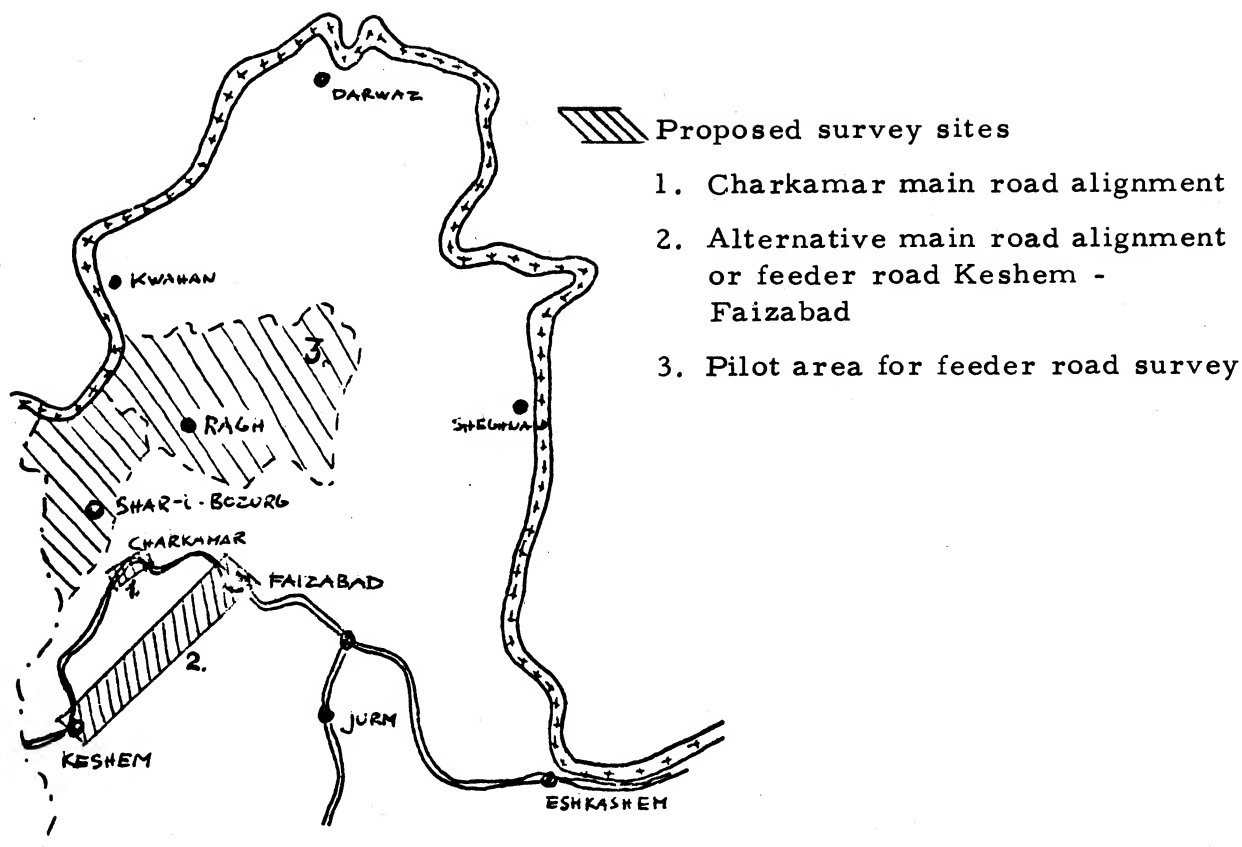
1. Assessment of transport demand by sub-government regarding the volumes of agricultural and industrial input-output, volumes of supply for construction material and domestic consumption.
2. Inventory of the present network giving details on structures, topography and soils, water courses etc. The main objective is to define physical bottlenecks.
3. Programme for the stage-wise improvement of the feeder road network
  - identification of selected routes
  - technical standards and cost estimates
  - maintenance organization
  - time schedule, and allocation of funds, labour and materials (cement, iron)

The survey could be carried out within one year consisting of approximately 30 man months.

The survey could be split in two phases so that a pilot area will first be surveyed. Experiences from the pilot project execution should then be analyzed to modify specifications in the terms of references for the next stage. As a pilot area to be surveyed Ragh and Shar-i-Bozurg are proposed. The team should consist of e.g.

- team leader                      civil engineer experience in rural development planning
- civil engineer                    road and bridge construction
- technician                        road construction and soil mechanics
- assistant for field trip arrangements

Figure 1



### 3. AIR TRANSPORT

#### 3.1 Present conditions

The extremely rough conditions for road construction have stressed the importance of the simultaneous development of air traffic facilities. The air transport accounts presently for a significant part of inter-regional passenger traffic.

Especially the activities of administration, health care and certain commercial functions rely on air transport when passenger transport is needed.

The importance of air transport in connection with goods transport is at present relatively modest and no scheduled cargo flights were reported to operate.

The climatological conditions in winter and spring frequently cause flight cancelations.

There are for the time being one medium and three minor air-fields in the Province namely: Faizabad, Kwahan, Darwaz and

Sheghnan. The technical features are given in table 7 and location in appendix 4.

Table 8 Airfields in Badakhshan

| Location | Strip length | Strip width | Pavement      | Elevation<br>(m) above<br>sea level |
|----------|--------------|-------------|---------------|-------------------------------------|
| Faizabad | 1500         | 30          | selec. gravel | 1270                                |
| Kwahan   | 600          | 30          | "             | 1175                                |
| Darwaz   | 700          | 30          | "             | 1722                                |
| Sheghnan | 750          | 30          | "             | 2197                                |

The aircrafts operating are of the Twin-Otter make with a capacity of about 20 passengers. The scheduled flights of the Province are linked to other parts of the country via Kunduz. Flight routes and frequency are as follows:

| frequency    | Route (with return flight)          |
|--------------|-------------------------------------|
| once a week  | Kunduz - Faizabad - Sheghnan        |
| twice a week | Kunduz - Faizabad - Kwahan - Darwaz |

The passenger volumes on separate links for August 1975 are given in Table 8.

No significant seasonal variations in the volume were reported. As a rough estimate the internal passenger traffic volume is 2 000 passengers annually and passenger traffic in and out of the region about 4 500 passengers annually.

Table 9 Passenger volumes on scheduled routes August 1975

| From - to | Kunduz | Faizabad | Kwahan | Darwaz | Sheghnan | Total |
|-----------|--------|----------|--------|--------|----------|-------|
| Kunduz    | -      | 76       | 35     | 42     | 9        | 162   |
| Faizabad  | 147    | -        | 13     | 23     | 22       | 205   |
| Kwahan    | 7      | 24       | -      | 3      | -        | 34    |
| Darwaz    | 30     | 52       | 3      | -      | -        | 85    |
| Sheghnan  | 30     | 16       | -      | -      | -        | 46    |
| Total     | 214    | 168      | 51     | 68     | 31       | 532   |

The capacity of the present scheduled air traffic is in accordance with the traffic demand.

### 3.2

#### Development objectives and tentative project proposals

The transport network of the Province must be analyzed from the standpoint that the different modes of transport should supplement and strengthen the effectiveness of one other. By now the network of minor airfields extends to the most remote northern sub-centres that will obviously have to wait several years for motorable road connections.

To give some tentative priorities for the stage-wise implementation of the network the following aspects have been considered:

- population density
- road conditions and planned new connections
- health care facilities (present and proposed)
- administrative function

The provincial authorities stressed the importance of additional airfields to be built in the following sub-centres. The priority order was defined by the team.

- |    |                       |     |                     |
|----|-----------------------|-----|---------------------|
| a) | Ragh or Shar-i-Bozurg | +++ |                     |
| b) | Jurm (southern)       | ++  |                     |
| c) | Qalai Panja (Wakhan)  | ++  | + = priority weight |
| d) | Eshkashem             | ++  |                     |
| e) | Zarkool (Wakhan)      | +   |                     |

Studies are carried out in the form of annual courses. In the first year the subjects comprise botany, chemistry, biology and zoology. Special agricultural subjects occupy the following four years. The curriculum also includes English and educational studies such as psychology.

#### 4. IRRIGATION

##### 4.1

##### Present situation

According to the 1967 statistics, about 69 % of the total grain yield in Badakhshan province was produced in irrigated areas. The irrigated area accounted for only about 34 % of the total cultivated area. This means that the yield for the irrigated area was four times higher per unit area on the average than that for the dry fields. The difference is not only the result of irrigation, since the type of soil, the cultivation methods, the crop species and the fertilizers also vary. The yields from dry farming vary greatly also in individual years depending on the annual precipitation.

Because the entire Badakhshan area is very mountainous and because large flat valleys are absent, the individual irrigation systems are on an average quite small. The largest coherent irrigated areas are in the neighbourhood of Jurm, Baharak and Keshem. The only irrigation scheme which is planned and carried out by the water and power authority is situated in Fayzabad. The main irrigation canal of this system will be 17,4 kilometres long when completed, and its planned capacity is 2,05 m<sup>3</sup>/s. The scheme is being carried out in two phases. After completion it will bring 1060 ha of land under irrigation. The work was started in 1969. Less than 9 km of channel have so far been completed. At the time of the field trip to Fayzabad, the canal was more or less dammed by silt and boulders so that the discharge was less than 0,5 m<sup>3</sup>/s.

All irrigation systems in Badakhshan operate according to the traditional method. Water is taken upstream from the river by main canals, which then convey water above the irrigated fields. Secondary and tertiary canals then distribute water to the fields. Water is let into the fields by making a cut in the small dykes of a secondary or a tertiary canal. The quantity of water is not measured, but the farmers have developed a good knowledge of how to irrigate.

The irrigation canals are constructed mainly of earth and stones. The only exception is the Fayzaland canal. This makes the water infiltrate into the bed of the canal to quite a large extent and the

So far the sites of the proposed airfields have not been surveyed. This should be done as soon as possible in order to work out an overall plan for the stage-wise extension of the network.

Average cost of a minor airfield (L = 700-1000 m, b=30 m gravel surface) is estimated to be in the order of 1,5 mill Afs. and accordingly costs of max. implementation 7,5 mill Afs. In the report on the feeder airlines project (ref. 9) a preliminary feasibility study was carried out where the possibility of establishing a cold storage at Faizabad airfield was considered.

The slaughter of animals should take place at the nearest airfield in the grazing areas and the carcasses should then be transported by air over a short distance to the cold storage. From the storage further transport would be handled by refrigerated trucks. This project implies that the main road will be constructed to enable economic transport. The feasibility of the project could be analyzed in detail once an overall plan on animal husbandry has been carried out.

#### 4. TELECOMMUNICATION

##### 4.1 Present conditions

The importance of a reliable and sufficient telecommunication network in the Province is more significant than in most other parts of the country due to the poor road conditions.

The present telecommunication network extends to the subcentres of the Province (Appendix 5). The capacity and reliability of the facilities are modest and causes temporary trouble to administrative, social and economic functions. The existing connections are all single wire systems.

##### 4.2 Development objectives and tentative project proposals

The development of the present facilities can be analyzed according to the following outline.

- a) extension of the network coverage (new centres to be linked to the system)
- b) rise of the capacity on certain links

The main functions that will benefit from alternative development courses are:

|                           |                                                                   |
|---------------------------|-------------------------------------------------------------------|
| extension of<br>coverage: | readiness of health care alarm system<br>administrative functions |
| increase in<br>capacity:  | administrative functions, economic<br>activities                  |

The coverage of the network is acceptable regarding the distribution of different functions. Thus in the present situation it is proposed that the increase in capacity and the reliability of operations be given first priority. In the Ministry of Communications a plan has been prepared which is in line with the above statement.

According to this plan a three channel system from Kunduz to Faizabad will be constructed within the next seven year plan (completion approximately 1978). The existing ordinary single lines to the subcentres will be doubled stage-wise and structures on the lines strengthened. Maintenance readiness should be increased accordingly.

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## CONTACTS

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## ROADS AND TRANSPORT

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## 1.

## SUMMARY

Badakhshan province is connected to the main country by a road and air transport system. For goods transport the road system is more important.

The main road and feeder roads are gravel-surfaced and mainly provided with wooden bridges over rivers. The condition of the roads is poor, which makes the traffic velocity low, wears vehicles heavily and increases the costs of transport. Transport costs increase prices, hinder the normal development of the province and lower the living standard of the people.

The difficulties in traffic conditions derive mostly from the mountainous landscape of the province, which places restrictions on road alignments and increases constructions costs, and hard climate conditions, which in the form of landslides, washes and erosion stop the traffic at times.

Road maintenance suffers from the lack of equipment so that the road surface is kept in poor shape. Weak bridges also constitute obstacles to heavier transport.

In addition to the efficiently cultivated river valleys, there are extensive dry hill farming areas (map) in the western part of the province. These areas in the Faizabad, Ragh, Shahre-i-Bozurg and Keshem regions have only horsetrack connections to the main road.

Being the only connection to the rest of the country, the main road is vulnerable to natural disasters, which in the rainy season can cut the traffic for weeks.

To improve the traffic conditions of the province the following measures were found to be essential

- Improvement of main road
- Improvement of feeder roads
- Construction of new feeder roads
- Construction of a double connection for the main road to avoid natural disaster areas
- Improvement of road maintenance

Two alternatives for main road alignment were studied. These were:

- Keshem-Faizabad along the Kokcha river
- Keshem-Artin Jelaw-Deghan Khana-Faizabad

The more advantageous alternative should be constructed as a main road and the other as a feeder road, which at the same time could serve as a double connection for the main road. The main road will be constructed at least as far as Baharak.

The most important feeder road to be constructed was found to be the road Arqa Keslaq - Ragh, which could later be extended as far as Khwahan and Shahr-i-Bozurg.

The improvement of existing feeder roads, already in progress by RDD, will be continued. The road maintenance project could be combined with this.

The construction costs of the main road were estimated according to the costs of Kunduz-Keshem road under construction. The traffic count and forecast of Keshem-Faizabad road showed however a remarkable decrease in the traffic load when compared with the Kunduz-Keshem section. This provides a possibility for stagewise construction in order to cut construction costs.

The bridges and the pavement could be constructed in the first stage for one lane only, although the road bed should be constructed for two lanes.

In project proposals the construction costs have been cut in accordance with this.

For the schedule of the main road construction the progress of the Kunduz-Keshem road work imposes restrictions. The access of construction machinery and equipment is difficult before the road bed and bridges are completed as far as Keshem.

The feeder road construction, on the contrary, is not so dependent on this condition being smaller in scale.

In any event a survey and planning phase should precede all these construction works.

The projects proposed for road improvement are as follows:

- RDD and WFP projects
- Road improvement Keshem-Artin Jelaw
- Road maintenance programme
- Road surveys
- Bridge at Arqa Keslak
- Feeder road to Ragh
- Low class road Artin Jelaw - Faizabad
- Main road Keshem - Artin Jelaw
- Main road Artin Jelaw - Faizabad
- Main road Faizabad - Baharak

## 2. THE EXISTING ROAD SYSTEM SITUATION

The Badakshan province landscape is hilly and mountainous crossed by river valleys, which are partly steep sloped gorges. This type of landscape imposes restrictions on road construction and increases construction costs.

The existing roads are gravel surfaced, mostly with wooden bridges over rivers. Roads follow river valleys partly on steep hillsides and partly on wider and even cultivated areas.

Bends and steep ascents reduce the traffic speed to less than 20 km per hour in most places and the rough surface severely taxes the suspensions of motor vehicles.

High transport costs and difficulties in traffic increase prices in the province area lower the living standard and hinder normal trade development.

### 2.1

#### Transport system of different areas

The motorable roads serve a rather narrow area on river valleys, though the biggest towns and most efficiently cultivated areas have road connections.

In addition to the major river valleys, there are widespread cultivated areas especially on the hill tracts north and south of Kokcha river which are below 2 500 meter's altitude and which have only horse track connections to the motorable main road.

There are also higher areas, which are used as pasture land for cattle raising and which do not require motorable road connections as urgently as the lower agriculture areas with dense permanent settlements mentioned above. Air connections to Kwahan, Darwaz and Sheghnan form an exception in traffic connections to a few areas in north. These do not, however, have economical significance in goods transport.

#### 2.1.1

##### Areas served with motorable roads

The areas are as follows:

- Keshem valley north and south of Keshem
- The narrow river valley of Kokcha between Keshem and Faizabad
- Faizabad valley

- Kokcha valley west of Baharak
- Zardew valley east of Baharak
- Warduj valley southeast of Baharak
- Kokcha valley south of Baharak (Jurm)
- Eskashem area
- The Pamir corridor east of Eskashem

### 2.1.2

#### Areas without motorable roads

Nearly all the higher areas outside the above-mentioned river valleys have no motorable road connections. They can be divided into lower agricultural areas and higher pasture areas.

### 2.1.21

#### Agricultural areas

Economically important areas without road connections are the densely populated agricultural areas below 2 500 m altitude. These areas are mostly located in the western part of the province.

The most important of these are:

1. The western part of the province north of the Kokcha river between Keshem and Baharak as far as the Ragh area in the north
2. The hill tract south of Kokcha between Keshem and Jurm
3. Small areas along the river Darya-i-Panj such as Khwahan, Darwaz, Sheghnan, etc.

### 2.1.22

#### Areas without a need for road

The higher areas without roads are important only as pasture land for cattle raising during summer-time and do not need roads very urgently. There is practically no permanent settlement due to the cut of even track connections during the winter-time and the lack of possibilities to cultivate the land. These cattle raising areas are located in the eastern part of the province. The Shewa river valley may be mentioned as an example.

## 2.2

### Characteristics of existing roads

The existing roads connect the biggest towns and the most effectively cultivated river valleys of the province. The roads are gravel surfaced and suffer from lack of maintenance equipment, weak bridges and partially hard nature conditions in the form of land slides, washes and erosion in the rainy season and snow in winter-time.

#### 2.2.1

Main road. Keshem - Eskashem 260 km

The main road is the backbone of the entire provinces transport and it crosses difficult landscape and areas with difficult nature conditions.

The main road starts from Keshem, follows the tributary of the Kokcha, the Mashad river and then the Kokcha river until Baharak. The road crosses the tributaries of the Mashad and the Kokcha, the largest of which are Wakshi, Teskan, Darayan and Hazara, for the first 40 kilometres. After Artin Jelaw, where the river Hazara crosses the road, begins the area of the severest natural threat and the most difficult landscape.

For the following 60 km as far as the Faizabad valley, the road continues along the steep slope of the gorge and every now and then crosses small rivers and washes, which may be over one kilometre in breadth.

This is the most vulnerable stretch of the main road for natural disasters which may block the road connection for weeks.

From Faizabad to Baharak for the first 20 km the road runs along the slope of the narrow Kokcha valley, where small rivers and washes cross the route in several places. The biggest crossing tributary is the Sum Darrah 14 km from Faizabad. For the last 20 kms before Baharak the road runs along an even, cultivated valley area.

From Baharak eastwards the road follows the river Warduj, a tributary of Kokcha, for 80 km until Zebak and from there the rivers Wazling and Tawan for 30 km to Eskashem. The road crosses the Warduj 36 kms from Baharak at Safyan, where a new bridge is under construction and at Kazden 60 kms from Baharak. At Kazden a bridge work has also been started.

The river valley of Warduj is fairly even and mostly suitable for roads. After Safyan the river broadens into a shallow lake and the road follows the lake along a narrow strip of the vertical hillside.

canals need regular maintenance. In most cases, however, infiltration is not a problem, because the individual irrigation schemes are small and water is sufficiently available. Regular maintenance is needed particularly in places where the canal runs along a steep hill slope and it is frequently blocked by washouts. Also the intake places have to be reconstructed usually after the overflow time in spring.

Some samples have been taken from the main springs and rivers in the low water period and have been analyzed accordingly. Using the USDA Handbook norms for irrigation water, which classify water into four quality classes depending on specific conductance (salinity)(S) and sodium adsorption ration (C), the water of Darya-i-Panj and Darya-i-Kokcha belong to class S<sub>1</sub>C<sub>2</sub>. The quality classes of individual springs vary between S<sub>1</sub>C<sub>1</sub> and S<sub>1</sub>C<sub>4</sub>. This means that in general terms the quality of irrigation water is good particularly in summer, when irrigation requirements are at their highest.

#### 4.2

##### Development potentials

The main rivers of Badakhshan Darya-i-Panj and Darya-i-Kokcha with their main tributaries are abundant in water throughout the year so that sufficient water is available for all irrigation purposes in the river valleys. Some smaller streams also have sufficient water for irrigation purposes during the entire growing season although some are drying up.

The ground water resources of these areas are too poor for irrigation purposes. Some springs, if they are not wholly needed for the drinking water supply, may be used for the irrigation of very limited areas.

From the irrigation point of view there are two kinds of cultivated fields in Badakhshan. Those in the narrow river valleys are more effectively cultivated and irrigation is used in most cases. Those in the highlands, 50 - 300 m higher than the river valleys, have not been irrigated due to lack of water at that level. The slopes are usually so steep that cultivation is not possible.

The possibilities of increasing the irrigated areas, particularly in the valley of Darya-i-Kokcha, are very limited. The valley of Darya-i-Panj was seen only in the Wakhan area during the field trip, but according to maps, the possibilities for big-scale irrigation projects are very limited there also. By constructing new canals at higher levels a wider strip of the valley could be irrigated, but in most cases the profit would be minimal.

In highland fields the soil is mainly aeolian loess and accordingly very suitable for cultivation. The topographical variations there

At the end the valley narrows in places and the road is cut into steep hillside.

### 2.2.2

Feeder roads Existing motorable feeder roads are as follows:

|   |                                 |        |
|---|---------------------------------|--------|
| - | Keshem - Saydokan               | 37 km  |
| - | Baharak - Jurm - Wajan Junction | 90 km  |
| - | Eskashem - Qala-i-Panj          | 120 km |

Of the non-motorable tracks, used as feeder roads, the following routes may be mentioned as the most important:

|   |                                  |       |
|---|----------------------------------|-------|
| - | Keshem - Deghan Khana - Faizabad | 65 km |
| - | Artin Jelaw - Deghan Khana       | 21 km |
| - | Arqa Qeslaq - Ragh               | 46 km |

All these feeder roads, with the exception of the Eskashem - Qala-i-Panj road, serve important agricultural areas.

### 2.2.3

Description of road alignments

The following description of road lines is based on 5 days' driving with a jeep on motorable parts of roads and 3 days' riding on non-motorable tracks between Keshem and Faizabad. Due to the short time available for the survey, the resulting description is not quite accurate, but includes sufficient data for a basic consideration of the choice of road alignments and difficulties in future construction work.

Faizabad - Keshem along the Kokcha River 112 km (Route 1)  
km

|          |                                 |
|----------|---------------------------------|
| 0.0      | Old bridge                      |
| 0.0-1.6  | Road on steep mountain side     |
| 0.3-0.5  | Landslide area                  |
| 0.5-14.9 | Road along even Faizabad Valley |
| 1.6      | New bridge                      |
| 2.6      | Bridge over irrigation channel  |
| 5.7      | Irish bridge                    |
| 6.0      | Irish bridge                    |
| 6.7      | Irish bridge                    |
| 7.4      | River bed                       |
| 7.6      | Irish bridge                    |
| 7.8      | Alternative route to Keshem     |
| 8.3      | Irish bridge                    |
| 9.4      | Bridge over irrigation channel  |

|            |                                                                                                            |
|------------|------------------------------------------------------------------------------------------------------------|
| 10.3       | Faizabad Airport                                                                                           |
| 14.9-44.0  | Road along less steep Kokcha Valley                                                                        |
| 18.1-18.4  | Wash                                                                                                       |
| 21.2       | Small wash                                                                                                 |
| 21.8       | Small wash                                                                                                 |
| 23.6-24.2  | Wash                                                                                                       |
| 27.3       | Dry river                                                                                                  |
| 28.5-28.8  | Wash                                                                                                       |
| 29.4-29.8  | Wash                                                                                                       |
| 32.2-33.4  | Big wash, small water flow                                                                                 |
| 33.9       | Small washes                                                                                               |
| 35.1-38.1  | Road on steep slope                                                                                        |
| 39.5       | Erosion Valley, small water flow                                                                           |
| 41.2-41.5  | Small washes                                                                                               |
| 41.6-46.6  | Road on steep slope                                                                                        |
| 44.0       | Crossing of possible feeder road along Nar Darrah Valley                                                   |
| 44.0-60.0  | Road mainly along steep mountain slope, once a kilometre on an average washes on rivers, soil less silty   |
| 60.0       | Possible feeder road along Pasa Darrah Valley                                                              |
| 60.0-69.4  | Road on less steep hill slopes, small dry river beds cross once a kilometre on an average, silty clay soil |
| 69.4       | Bridge over Hazara, Artin Jelaw, starting point of important road alternative to Faizabad                  |
| 69.4-98.3  | Road on more or less narrow river valley, crossing rivers, soil silty, no washes                           |
| 80.3       | Bridge over Darayan river                                                                                  |
| 87.4       | Bridge over Teskan river                                                                                   |
| 94.6       | Mashad river joins Kokcha                                                                                  |
| 98.3       | Wakshi river crosses the road                                                                              |
| 98.3-111.6 | Road along even Keshem Valley, soil silty                                                                  |
| 111.6      | Keshem school                                                                                              |

#### Keshem - Deqhan Khana Faizabad 65 km    Route 2

For the first 30 kilometres from Keshem to Qarlogh Qorogh the roadline goes through a hill area and crosses the river Wakhsi, Teskan and Darayan. The altitude varies between 1 100 and 2 000 metres above sea level. On 80 % of this part of the route the gradient of the road alignment is 8 % or more.

For the next 20 kilometres the route passes through more even landscape, where the altitude lies between 1 900 and 2 000 metres and the slopes are less steep than in the first part. At Deqhan Khana the roadline crosses the river Hazara.

On the last 15 kilometres the route goes down to the Kokcha river valley along steep hill sides and crossing small rivers. In this area the altitude drops from 1 800 to 1 200 metres.

Keshem - Artin Jelaw - Faizabad 80 km Route 3

From Keshem route 3 follows route 1 along the Kokcha river for the first 40 kilometres to Artin Jelaw. From Artin Jelaw the route continues along the south bank of the river Hazara for 5 kilometres where it crosses the river near Sam Qaroi. It then follows an old track on the north side of the river for 2 kilometres. After this it follows a rocky and steep river valley downstream for 1 kilometre, where difficulties with the rock may occur. There are then 5 kilometres along even riverside, where soil conditions could be difficult.

The route then crosses the river and follows a tributary of the Hazara through Cenar for 8 kilometres joining route 2, which is then common to both routes until Faizabad.

Faizabad - Baharak 40 km

km

|       |                                                                  |
|-------|------------------------------------------------------------------|
| 0- 7  | Passable, no damage                                              |
| 7-13  | Small washes                                                     |
| 14    | Possible feeder road north along Sum Darrah river Valley, bridge |
| 13-19 | Steep river bank of Kokcha narrow space for road small washes    |
| 19-40 | Even road through cultivated area                                |
| 31    | Feeder road to Siva Valley north                                 |
| 40    | Bridge over Sardew river                                         |

Baharak - Jurm 20 km

km

|       |                                                                       |
|-------|-----------------------------------------------------------------------|
| 0- 5  | Even road through cultivated areas                                    |
| 5     | Road junction to Eskashem and bridge                                  |
| 5-12  | Even cultivated landscape between the Warduz and Kokcha river valleys |
| 12    | Bridge over the Kokcha and steep ascent to the left Kokcha bank       |
| 12-16 | Even road along river bank, small crossing, erosion valleys           |
| 16-20 | Even road through cultivated area                                     |

Baharak Bridge - Kazden 60 km

km

|       |                                                                                                             |
|-------|-------------------------------------------------------------------------------------------------------------|
| 0-10  | Almost even area, big boulders near road, small hills                                                       |
| 10-36 | Broader river valley, more cultivation, even road                                                           |
| 14    | Zakara, small tributary of Warduz, bridge, high waterfall 1 km upstream                                     |
| 36    | Safyan, bridge over Warduz, new bridge under construction                                                   |
| 36-50 | Broad river bottom, almost lake, road on narrow, left bank strip, vertical hillside partly on the land-side |
| 50-60 | Even area on left river bank, small scale agriculture                                                       |
| 59    | Bridge over Warduz                                                                                          |
| 60    | New bridge under construction at Kadzen                                                                     |

Jurm - Wajan River junction 70 km

km

|       |                                                                                                             |
|-------|-------------------------------------------------------------------------------------------------------------|
| 0-10  | Even road through cultivated Kokcha river Valley                                                            |
| 10    | Bridge over Kokcha                                                                                          |
| 10-30 | River in narrow steep bank valley with 20-30 metre depth road, partly on steep bank, partly on broader area |
|       | River valley suitable for upper basin of power station                                                      |
| 18    | Fric river valley                                                                                           |
| 30-53 | Road on broader valley, crossing tributaries of the Kokcha                                                  |
| 37    | Jocham Valley                                                                                               |
| 50-54 | Erghesak Valley                                                                                             |
| 53    | Hadzrate Said village                                                                                       |
| 53-70 | More narrow Kokcha valley road, partly on steep hillside                                                    |
| 70    | River junction Lapis Lazuli Mains and Wajan directions                                                      |
| 70    | The road continues in Lapis Lazuli Mains direction, hardly jeepable, follows high very steep hillside       |

Feeder road south from Keshem 37 km

km

|      |                                                                               |
|------|-------------------------------------------------------------------------------|
| 0    | Starting point of the feeder road from Keshem-Taluqan road near Keshem bridge |
| 0-31 | Road goes along even Keshem valley, small washes and crossing river beds      |
| 30.1 | New bridge over Keshem river                                                  |

- |       |                                                                                    |
|-------|------------------------------------------------------------------------------------|
| 31-37 | Road continues mainly along more or less steep hillside                            |
| 37    | Saydokan, crossing point of three tributaries, bridge, another under consideration |

## 2.3

### Transport problems

The mountainous landscape of the Badakhshan province renders road construction difficult and makes it expensive.

Another difficulty to be faced, as a result of the nature, is the climate, which in the form of rain and snow can block the connection from time to time.

The main route suffers from bends steep gradients and rough gravel surface which together essentially lower the traffic velocity.

Extensive important agricultural areas have no motorable road connection to the main road, which hinders the natural development of the areas.

The main road is the only motorable connection from the province to other parts of the country. Dependence upon natural conditions makes the only connection vulnerable. In the event of a natural disaster the connection is cut for weeks because of the lack of adequate clearing machinery.

The difficulties resulting from natural conditions derive from the landscape and the climate.

### 2.3.1

#### Natural conditions

The mountains prevent road construction or make it extremely expensive. In Badakhshan the roads mostly follow rivers, where the profile is more even and construction work easier.

During winter snow blocks the roads at times, but the greatest damage is caused in the warmer period by rains. The main types of rain damage are as follows:

- Erosion forms deep valleys in fine soil and cuts the road
- Washes bring fine soil and boulders along temporarily flowing river beds to the road
- Temporarily flowing rivers after rains cut the traffic in places where bridges have not been constructed

### 2.3.2

#### Road structures

Traffic difficulties also derive from weak or non-existent road constructions. The main types are as follows:

- Fine soil material on the road base and surface may soften the road in wet conditions and damage take place as a result of heavy loaded vehicles.
- Temporary irrigation channels cross the road and turn the surface into small furrows.
- Bends, steep gradients and rough surface cut the traffic velocity.
- The lack of maintenance machinery keeps the road surface in poor condition and increases the clearing time after natural disasters.
- Weak bridges cut the access of heavier transport.

### 2.3.3

#### Problems of one single connection

The traffic of the main road is largely dependent upon natural conditions. During the rainy season landslides, washes and erosion often take place in the Kokcha valley, especially in the area west of Faizabad. In May 1976 heavy rains caused washes in the Kokcha valley west of Faizabad on more than 10 kms of the road. Road clearance took more than 2 weeks, during which period the province was totally separated from the rest of the country.

This indicates the need for double road connections in order to avoid the vulnerability of a single connection.

## 2.4

Traffic counts, estimates and forecasts

A traffic count was conducted by the Russian road survey team during 31 May - 6 June 1971 with the following results:

Traffic intensity count

|                                                      | Number of mobile units on the road sections |                     |                     |
|------------------------------------------------------|---------------------------------------------|---------------------|---------------------|
|                                                      | Kunduz<br>Khanabad                          | Khanabad<br>Talugan | Talugan<br>Faizabad |
| Automobiles with load-carrying capacity up to 3 tons | 106                                         | 10                  | 1                   |
| Automobiles with load-carrying capacity up to 5 tons | 99                                          | 67                  | 10                  |
| Automobiles with load-carrying capacity over 5 tons  | 106                                         | 40                  | 14                  |
| Passenger buses                                      | 31                                          | 26                  | 3                   |
| Cars                                                 | 124                                         | 28                  | 9                   |
| Total number of automobiles including                | 466                                         | 171                 | 37                  |
| Lorries                                              | 311                                         | 117                 | 25                  |
| Buses and cars                                       | 155                                         | 54                  | 12                  |
| Cart and pack transport                              | 616                                         | 341                 | 288                 |

The development of traffic intensity was estimated as follows:

Traffic intensity forecast

| Item | Name of the section | Length km | Intensity of traffic per day in both directions |           |       |      |
|------|---------------------|-----------|-------------------------------------------------|-----------|-------|------|
|      |                     |           | Total                                           | 1980      |       |      |
|      |                     |           |                                                 | 1990      |       |      |
|      |                     |           | Total                                           | Including |       |      |
|      |                     |           |                                                 | Lorries   | Buses | Cars |
| 1    | 2                   | 3         | 4                                               | 5         | 6     | 7    |
| 1    | Kunduz-Khanabad     | 25        | 600                                             | 400       | 50    | 150  |
|      |                     |           | 950                                             | 550       | 100   | 300  |
| 2    | Khanabad-Taluqan    | 43        | 400                                             | 300       | 20    | 80   |
|      |                     |           | 600                                             | 400       | 50    | 150  |
| 3    | Taluqan-Farkhar     | 26        | 200                                             | 150       | 10    | 40   |
|      |                     |           | 300                                             | 210       | 20    | 70   |
| 4    | Farkhar-Keshem      | 42        | 170                                             | 130       | 10    | 30   |
|      |                     |           | 250                                             | 180       | 10    | 60   |
| 5    | Faizabad-Keshem     | 109       | 250                                             | 160       | 20    | 70   |

The transport volume was found to divide according to road section as follows:

Transport volume sectionwise

| Name of road section | Length km | Years | Qnt. of goods, following on the road section in both |             |          | Goods turnover thousand km |
|----------------------|-----------|-------|------------------------------------------------------|-------------|----------|----------------------------|
|                      |           |       | There (to)                                           | Back (from) | In (all) |                            |
| Kunduz - Khanabad    | 25        | 1970  | 52                                                   | 101         | 153      | 3 825                      |
|                      |           | 1980  | 90                                                   | 40          | 130      | 5 750                      |
|                      |           | 1990  | 165                                                  | 205         | 370      | 9 250                      |
| Khanabad - Taluqan   | 42        | 1970  | 38                                                   | 79          | 117      | 4 914                      |
|                      |           | 1980  | 65                                                   | 155         | 220      | 7 560                      |
|                      |           | 1990  | 120                                                  | 180         | 300      | 12 600                     |
| Taluqan - Farkhar    | 26        | 1970  | 31                                                   | 34          | 65       | 1 690                      |
|                      |           | 1980  | 45                                                   | 50          | 95       | 2 470                      |
|                      |           | 1990  | 85                                                   | 65          | 150      | 3 900                      |
| Farkhar - Keshem     | 43        | 1970  | 29                                                   | 18          | 47       | 2 021                      |
|                      |           | 1980  | 45                                                   | 30          | 75       | 3 225                      |
|                      |           | 1990  | 80                                                   | 40          | 120      | 5 160                      |
| Keshem - Faizabad    | 109       | 1970  | 31                                                   | 10          | 41       | 4 469                      |
|                      |           | 1980  | 40                                                   | 25          | 65       | 7 085                      |
|                      |           | 1990  | 75                                                   | 35          | 110      | 11 990                     |
| Total                | 245       | 1970  | -                                                    | -           | -        | 16 919                     |
|                      |           | 1980  | -                                                    | -           | -        | 26 090                     |
|                      |           | 1990  | -                                                    | -           | -        | 44 890                     |

The transport volume forecast according to type of goods was estimated to be:

Transport Volume Forecast

| Item  | Name of goods                                                                         | 1970 | 1980    | 1990    |
|-------|---------------------------------------------------------------------------------------|------|---------|---------|
| 1     | 2                                                                                     | 3    | 4       | 5       |
| 1     | Machines, equipment, metal, spare parts, oil and oil-products                         | 23   | 30-35   | 40-45   |
| 2     | Cement and other building materials                                                   | 3    | 5       | 10-15   |
| 3     | Industrial and food-stuffs for national consumption                                   | 41   | 50      | 60      |
| 4     | Agricultural products, including the products of primary processing of farm raw stuff | 87   | 110-130 | 200-250 |
| 5     | Mineral fertilizers                                                                   | 3    | 15-20   | 50-60   |
| Total |                                                                                       | 157  | 210-240 | 360-430 |

From these data the big difference in the sectionwise traffic volume and intensity was revealed. On the section near Kunduz the figures were three times greater than between Keshem and Faizabad.

One should, however, remember the differences in the stage of development of these areas due to transport conditions.

The rate of overall development of the Badakhshan area after the improvement in road connections will no doubt exceed the rate of the already developed areas.

are, however, so distinct that the construction of irrigation systems would be very laborious.

#### 4.3

##### Irrigation requirements

To produce a good yield in easy circumstances, at least 200 kg of water are needed for one kilogramme of dry weight according to most calculations. Too high a temperature on the surface of the leaves, the low growing capacity of the soil, scarcity of water and many other factors often weaken the effectivity of water use.

Assuming that water is consumed moderately e.g. 500 kg for one kg dry weight grain, and the yield target is 2000 kg per hectare, one million kilogrammes of water will be needed for the irrigation of one hectare. This corresponds to 100 millimetres of water on the surface. It is not difficult to provide plants with this amount of water in suitable terrain conditions.

In dry farming the crops usually lacking rain completely during the growing season. Thus the water storage capacity of the soil plays an important role in dry farming. The sandy loess soils are relatively good in this respect and the main problem may be weak fertilization rather than water shortage. As the other half of the dry season is usually available for crop production at the end of growing season, irrigation is in a key position when double crops are considered.

The water needed for irrigation should be pumped up from the rivers or from the canals in the valleys. This is rather expensive due to the big differences in height and to the fact that cheap electric power is not available.

It is not enough to assess the area planned for irrigation according to the height contours only, since in some places in the valleys there are very rough stretches with boulders, which are suitable only for scattered tree planting and some grazing. This kind of land use does not imply any sort of irrigation.

Attention should be paid to the water distribution of the irrigation channels in spite of the fact that most rivers have a sufficient discharge throughout the year. With the increasing and diversified use of water the present channels will become underdimensioned. Thus the water consumption of the water mills and the future power station should be adjusted to the basic needs for agriculture.

When a large scale hydroelectric power station in Darya-i-Kokcha is planned, the irrigation possibilities should also be taken into account.

3.

## ROAD IMPROVEMENT

Objectives

In May 1976 heavy rains brought landslides, erosion and washes, which damaged the roads and cut the motor vehicle traffic of the main road for several weeks in the Badakhshan area.

The dependence of transport on natural conditions and the vulnerability of the main road connection were clearly recognized.

This, together with field investigation and map survey, provided basis for defining the objectives of improvements in the transport system of the province. These are:

- Improvement of the main road class
- Construction of motorable, feeder roads from the main road to the most important agricultural areas
- Construction of a double road connection between Keshem and Faizabad to increase the safety of transport endangered by climatic conditions.

During the investigation period the characteristics of the main road, feeder roads and other alternatives for the main road alignment were studied.

Motorable roads were found to be in poor condition, which lowers the traffic speed and increases transport costs.

Machinery and equipment for road maintenance were mostly lacking, which was the reason for the poor road conditions and which increased the clearance period after natural disasters.

From the alternatives for a main road between Keshem and Faizabad, the routes Keshem - Faizabad along Kokcha river and Keshem-Artin Jelaw-Deqhan Khana-Faizabad were found to be more suitable for further investigation than the route Keshem - Deqhan Khana - Faizabad since 80 % of the first 30 km from Keshem was found to include an 8 % or greater gradient in longitudinal profile, which makes this alternative the most expensive to construct and most difficult to maintain.

The main part of the dry hill farming area in the province is located north and south of the Kokcha river between Keshem and Baharak.

Because these areas have no motorable road connection, the construction of feeder roads was found to be extremely urgent to the development of the areas.

A through road survey is necessary for planning the roads to be constructed and finding the most suitable alternative for main road.

The short-term investigation and construction programme should include the following:

- Investigation and planning project
- Main road construction projects
- Feeder road construction projects

In order to decrease construction costs the main road class and stagewise construction method should be considered during planning.

### Main road alternatives

Between Keshem and Faizabad three alternative road alignments were studied. These were as follows:

1. Route along Kokcha River
2. Straight route over the hill area Keshem - Deqhan Khana - Faizabad
3. Route Keshem - Artin Jelaw - Deqhan Khana - Faizabad

The 2nd route was found to be the most difficult for main road construction. Between Keshem and Deqhan Khana 80 % of the length was found to have a gradient of 8 % or more in longitudinal section.

This leaves only alternatives 1 and 3 to be considered as main road alignment.

Since only alternative 1 was surveyed by Russian experts the selection of an alternative should be done only after a survey of alternative 3. After the survey more detailed cost estimates may be made and the alternatives compared economically.

Some of the advantages and disadvantages of both alternatives are, however, as follow:

Route 1 along Kokcha River

Advantages:

- More even longitudinal profile
- Ready construction of the existing road

Disadvantages:

- Longer alignment
- More vulnerable to natural disasters due to the climate

- Requires larger and more expensive engineering structures in construction

#### Route 2 Keshem - Artin Jelaw - Faizabad

##### Advantages:

- Shorter alignment
- Serves also as a feeder road a widespread densely populated agriculture area
- Less vulnerable to natural conditions due to rains
- Requires special structures such as bridges and retaining walls to a lesser degree when passing higher areas nearer the starting points of rivers

##### Disadvantages:

- More rough longitudinal profile due to bigger differences in altitude
- Near Faizabad steep gradient requiring serpentines when descending from the hills

### 3.1

#### Road Construction

The main road should be constructed in the category of Class IV.

The work should be carried out as a mechanized construction operation and the machinery and manpower divided into subdivisions according to the different functions of the construction work.

Different groups should be organized for:

- asphalt and concrete production
- construction of engineering structures
- road bed construction
- construction of pavement layers
- stone material excavation and preparation and
- transportation

The Keshem - Faizabad road work may be completed within about 4 years when using the same machinery and manpower as already used for road construction on Kunduz - Keshem road work. The machinery and manpower will be available after 1980, when the first part is completed.

The labour force employed for the present work is composed of 1860 construction workers and 960 drivers and operators.

### 3.1.1

#### Unit Costs

Fresh information about road construction costs was received from the Russian experts who constructed the road east of Kunduz. The average cost of 10 m base, paved road was reported to be 8 000 000 Afs per kilometre.

More detailed information about the same road construction was received from Russian experts who worked at the Ministry of Public Works, Kabul. These unit costs may be found in the following Unit Cost List.

For comparison fresh unit costs of road construction were also received from the Rural Development Department, Kabul dealing with smaller roads.

#### Unit Cost List

|                                                  | Unit           | R. D. D<br>Afs. | USSR<br>Afs. |
|--------------------------------------------------|----------------|-----------------|--------------|
| Asphalt pavement                                 |                |                 |              |
| 4 cm cold bitumen                                | m <sup>2</sup> | -               | 150          |
| 5 cm hot bitumen                                 | m <sup>2</sup> | -               | 200          |
| Bridge                                           | m <sup>2</sup> |                 | 15 000       |
| Reinforced, bituminized<br>stone masonry culvert |                |                 |              |
| 0,5 m x 1,5 m                                    | m              | 2 200           | -            |
| 1,0 m x 1,0 m                                    | m              | 3 400           | 4 000        |
| 1,5 m x 1,5 m                                    | m              | 4 800           | 6 000        |
| 2,0 m x 2,0 m                                    | m              | 5 600           | 10 000       |
| 2,5 m x 2,5 m                                    | m              | 6 400           | -            |
| Concrete overflow bridge                         | m <sup>2</sup> | -               | 1 500        |
| Stone masonry structure                          | m <sup>3</sup> | -               | 800          |
| Earth work                                       | m <sup>3</sup> | -               | 50           |
| Gravel                                           | m <sup>3</sup> | 90              | -            |
| Stone                                            | m <sup>3</sup> | 120             | -            |
| Steel                                            | kg             | 30              | -            |
| Logs                                             | m <sup>3</sup> | 1 600           | -            |
| Timber                                           | m <sup>3</sup> | 1 200           | -            |
| Cement                                           | 50 kg          | 75              | -            |
| Skilled labour                                   | manday         | 100-120         | -            |
| Unskilled labour                                 | manday         | 40              | -            |

## 3.1.2

## Construction Costs

The construction cost of the present Kunduz - Keshem and work has reported to be 8 000 000 Afs. per kilometre.

The costs of the Keshem - Faizabad road will be higher because of the rougher landscape, which requires considerably more cutting and filling work. The average costs will be 9 - 10 mill. Afs. per kilometre.

The construction costs of the road construction programme for the near future will be as follows:

| Main road                                                                    | Afs.  | Afs.             |
|------------------------------------------------------------------------------|-------|------------------|
| - Keshem - Artin Jelaw                                                       | 38 km | 339 000 000      |
| - Artin Jelaw - Faizabad along the Kokcha river                              | 66 km | 650 000 000      |
| - Artin Jelaw - Deqhan Khana - Faizabad, 2nd alternative (no data available) | 46 km | no estimate      |
| - Main road - Ragh                                                           |       | 70 - 140 000 000 |
| - Artin Jelaw - Deqhan Khana - Faizabad                                      |       | 70 - 140 000 000 |

## 3.1.3

## Manpower requirements

The labour force required for the main road construction may be divided into the following group types according to their function in construction work:

|                                                                           | Construction workers | Drivers and operators |
|---------------------------------------------------------------------------|----------------------|-----------------------|
| Road construction                                                         | 690                  | 410                   |
| Construction of engineering structures. Preparation of road bed materials | 165                  | 180                   |
| Production of asphalt and concrete at plants                              | 240                  | 130                   |
| Other works                                                               | 300                  | 120                   |
| Total                                                                     | 1 395                | 840                   |

## 3.2

Road Maintenance

The first stage road report gives lists of the necessary equipment, staff and operations for the maintenance of different types of roads. Also the costs of maintenance and improvement work have been reviewed according to studies made for local purposes.

A special project proposal for an intensified maintenance programme was also prepared dealing with the equipment, manpower requirement and costs. The annual staff costs of one kilometre gravel road maintenance was found to be 5 300 - 6 500 Afs.

When the equipment is completely lacking, as is the case in Badakhshan, a special programme should be developed in order to purchase it and train drivers and machine operators to use this.

The volume of maintenance operations after the construction of new roads will increase, which emphasizes the benefits of urgent measures in starting the maintenance programme.

## 3.3

Proposals and Projects

In order to improve the transport system of the Badakhshan Province the main road and feeder roads north and south of the Kokcha valley should be constructed.

The main road alternative 1. along the Kokcha valley has already been surveyed and planned by Russian experts, but the feeder road alignments should be investigated to find the best location and also to study the alternative 2. for the main road Keshem - Artin Jelaw - Deqhan Khana - Faizabad. The more economical alternative should be constructed as the main road and the other as a feeder road. At the same time a double connection will be formed through the most difficult area of natural conditions.

## 3.3.1

Further investigations

The investigations to be conducted before the construction period are as follows:

- Study of main road alternatives between Keshem and Faizabad.

The routes should be surveyed and planned in order to find the most economical and suitable one to construct and use.

- Survey and planning of feeder road alignments

Sufficient time for investigations is available before 1980, when the main road construction reaches Keshem from the Kunduz direction.

The survey may be started in 1977 and completed in 1979.

The field survey and planning requires a team of surveyors as follows according to the first stage road report.

- Team leader, experienced in rural development  
Civil engineer planning
- Civil engineer road construction
- Technician road construction and soil mechanics
- Technician road construction and soil mechanics
- Auxiliary staff

The survey may be carried out in two years and requires a about 80 manmonth's work.

The tentative estimated cost of the technical personnel will be in the class of US \$ 180 000.

Other costs required for the equipment, office, travel etc. will be US \$ 90 000.

### 3.3.2

#### Road Construction Projects

##### 3.3.21

#### Main road Keshem - Artin Jelaw 38 km

|                                 |                          |
|---------------------------------|--------------------------|
| Road characteristics (Class IV) |                          |
| Road bed                        | 10 m                     |
| Bitumen Surface                 | 7 m                      |
| Maximum gradient                | 8 %                      |
| Minimum horizontal curve radius | 60 m                     |
| Minimum vertical radius         |                          |
| - convex                        | 3 000 m                  |
| - concave                       | 1 500 m                  |
| Work volume                     |                          |
| Earth work                      |                          |
| - Cutting and filling           | 2 200 000 m <sup>3</sup> |
| - Road bed materials            | 280 000 m <sup>3</sup>   |
| Bridges 6 pc                    | 3 500 m <sup>2</sup>     |
| Culverts                        | 151 pc                   |
| Bitumen surface                 | 266 000 m <sup>2</sup>   |
| Retaining walls                 | 12 500 m <sup>2</sup>    |

| Cost estimate                        | Afs.              |
|--------------------------------------|-------------------|
| Clearing of road area                | 10 000 000        |
| Earth work                           |                   |
| - Cutting and filling                | 90 000 000        |
| - Road bed materials      33 600 000 | 28 000 000        |
| Bitumen surface                      | 74 500 000        |
| Bridges                              | 52 500 000        |
| Culverts                             | 13 200 000        |
| Retaining walls                      | 4 800 000         |
| Other works                          | <u>66 000 000</u> |
| Total                                | 339 000 000       |
|                                      | =====             |

## 3.3.22

Main road Artin Jelaw - Faizabad 66 km

Alternative 1. along the Kokcha river  
Road characteristics: See 3.3.21

| Cost estimate         | Afs.               |
|-----------------------|--------------------|
| Clearing of road area | 16 500 000         |
| Earth work            |                    |
| - Cutting and filling | 141 000 000        |
| - Road bed materials  | 47 600 000         |
| Bitumen surface       | 129 360 000        |
| Bridges               | 147 500 000        |
| Culverts              | 19 280 000         |
| Retaining walls       | 8 350 000          |
| Other works           | <u>140 410 000</u> |
| Total                 | 650 000 000        |
|                       | =====              |

## Work volume

|                       |                          |
|-----------------------|--------------------------|
| Clearing of road area | 1 650 000 m <sup>2</sup> |
| Earth work            |                          |
| - Cutting and filling | 4 400 000 m <sup>3</sup> |
| - Road bed materials  | 396 000 m <sup>3</sup>   |
| Bitumen surface       | 462 000 m <sup>2</sup>   |
| Bridges 20 pieces     | 9 800 m <sup>2</sup>     |
| Culverts              | 189 pc                   |
| Retaining wall        | 20 860 m <sup>2</sup>    |

## 3.3.23

Feeder roads Without a survey the location and evaluation of the feeder road projects is difficult.

Only very rough estimates of the costs may be made. As already discussed the most important feeder roads will serve the areas north and south of the Kokcha valley between Keshem and Baharak.

The feeder road north should go to Ragh and the southern area will be served by the Artin Jelaw - Deqhan Khana - Faizabad road, which at the same time forms a double connection passing the difficult natural disaster area.

The southern feeder road will be constructed as a feeder road according to alternative 1, when the main road follows the Kokcha valley. If the road survey proves more advantageous the alternative 2, the southern route will be constructed as a main road and the Kokcha valley road will be improved to feeder road, standard.

The feeder roads will be gravel-surfaced lower class roads and the construction costs should remain in the class 1 500 000 - 3 000 000 Afs. per kilometre.

In the event that construction takes place according to alternative 1, the total costs of both feeder roads, south and north of the Kokcha valley, will be 70 - 140 million Afs.

#### Projects for the near future

Survey, feasibility studies and planning of main road alternatives feeder roads and maintenance programme.

#### Projects which may be started immediately

Construction of main road Keshem - Artin Jelaw, because it has already been planned by USSR experts and there is no reasonable alternative for alignment.

#### Projects which may be started after preceding activities

Artin Jelaw - Faizabad main road construction after finding the best alignment of alternatives through survey, feasibility study and planning.

- Feeder road constructions after survey, feasibility study and planning
- Road maintenance project after feasibility study

### Possible factors which may affect the near future programme

The main road Kunduz - Keshem will be completed 1980.  
Before 1980 difficulties may be faced in the form of the accessibility of heavier machines to the area and the availability of road construction machinery and trained road workers.

### Long-term projects

For the development of the transport system additional road construction should take place after the near future programme. The most important of these are as follows:

- Faizabad - Baharak main road construction
- Improvement of existing feeder roads

## 4.4

Development strategies and priorities

The Water and Power Authority has two irrigation projects in Badakhshan, one under construction in Fayzabad, and the other in the neighbourhood of Darwaz, "Karasti jui protection and intake", which is waiting implementation. A feasibility study of the Kol-i-Seva lake irrigation project has been undertaken by a group of Russian experts. The report has been written in Russian and Farsi, but was not available in English translation. The Kol-i-Seva area is located very high (over 3000 m), which means that general conditions for cultivation there are rather limited.

The studies and surveys dealing with the irrigation possibilities in Badakhshan have been limited to some individual projects only. During the Badakhshan field trip it was possible to obtain only a general view of the problems and potentials, but e.g. a preliminary localization of future irrigation projects implies additional studies.

Generally speaking the main issues which should be emphasized during the next years are as follows:

- The completion of the Fayzabad irrigation scheme
- The development of existing systems by reinforcing the water intakes and other unprotected places with concrete construction
- The undertaking of preliminary and feasibility studies for new schemes

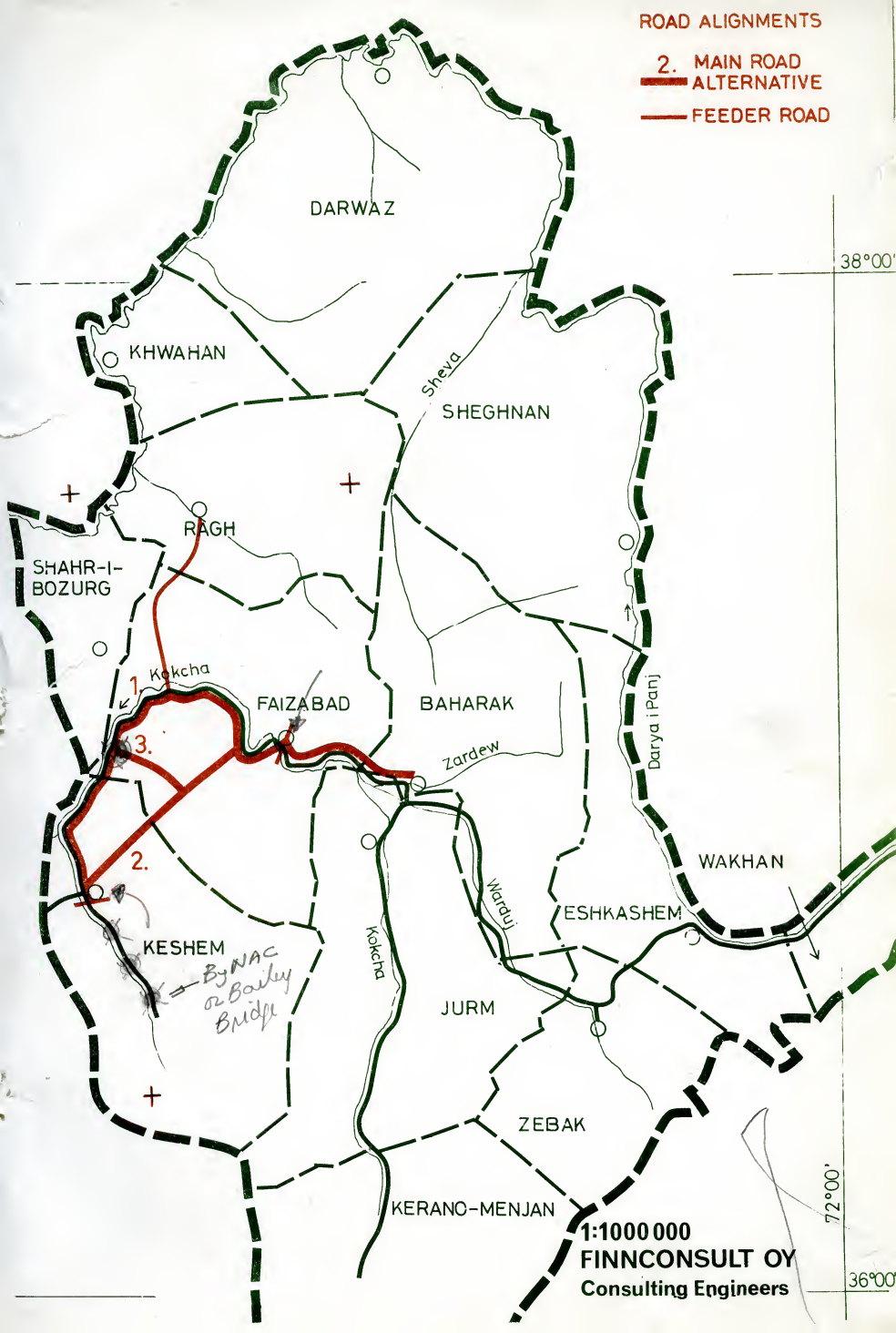
There are no facilities for training ordinary farmers. The Ministry of Agriculture and Irrigation has employed special extension officers and agents for this purpose, some of whom are stationed at the Kabul cooperative centre.

The training of extension officers with Afghan training staff may be considered satisfactory, as last year 180 agricultural engineers successfully completed their studies. The level of instruction is good as far as material equipment is concerned.

ROAD ALIGNMENTS

2. MAIN ROAD  
— ALTERNATIVE

— FEEDER ROAD



1:1000 000  
FINNCONSULT OY  
Consulting Engineers

R  
2.12111  
UND  
4607 v.3



5.

## REGIONAL DEMAND FOR FOOD

5.1

Nutrient target

Afghans are generally better fed than many Asians. However, people often lack a well-balanced diet. Protein and vitamin deficiencies are widespread. Rice, whole wheat bread, and tea and sugar (mostly without or instead with unpure rock salt) constitute the main diet, which is supplemented with limited amounts of mutton, beef, eggs and vegetables. In the summer, melons and fruits are often eaten to the exclusion of other nutritional requirements. Vitamins, particularly Vitamin D, are noticeably lacking.

The minimum nutrient intake requirements are not generally known. Recommendations by experts vary between 2000 and 2300 kcal of energy and 40 - 50 grammes of protein per person daily.

5.2

Present food balance

It is assumed that every one should have the opportunity of consuming at least 100 kilogrammes of cereals, 80 kilogrammes of starchy roots, 10 kilogrammes of oilseeds and 30 kilogrammes of legume seeds annually. This diet will result in a daily intake of about 2100 kcal and 47 grammes of protein per head, which should be satisfactory. For an average household of six adults and four children of half consumption this may be annually calculated as follows:

|              |        |          |         |                |
|--------------|--------|----------|---------|----------------|
| Wheat        | 800 kg | 114 seer |         | Average        |
| Oilseeds     | 80 "   | 11 "     | Total   | production for |
| Legume seeds | 240 "  | 34 "     | 1120 kg | Badakhshan     |
| Potatoes     | 640 "  | 91 "     |         | 1224 kg        |

Excluding potatoes, which present one tenth of the energy content in the calculation, the self-sufficiency rate is about 90 per cent.

It should be emphasized that the above figures concern only with plant protein. Animal protein should be included in the diet to avoid protein malnutrition.

## 6. DEVELOPMENT PROJECTS

Some projects of first priority in the field of agriculture development are presented briefly in the following. The main emphasis is placed on irrigation and agricultural training as well as on experimental activities. Thus the productivity of crop cultivation will be raised partly by introducing and teaching modern methods and partly by taking direct measures to improve the cultivation conditions. There is no way to make more detailed recommendations on the basis of the information available at the time of report writing. Special project planning is needed even before final recommendations are made.

### 6.1

#### Pasture trials and pasture improvment

Free use of pasture land is available to anyone. This fact discourages farmers from keeping the pastures in good condition. The amount of fallow or abandoned cultivated land indicates that cultivation is not possible every year. This is why it is recommended that pastures be established on selected fields, which should represent the same quality as the present fallow fields. The experimental pastures should be tilled and sewed and protected from grazing for two or three years. Weeding should be done regularly and whenever necessary.

Another form of pasture experiment is the rehabilitation of present pastures. An experiment should be organized at a suitable place where free grazing two years full protection and partial protection could be compared to each other. It can be expected that the more valuable species would recover and pasture economy be improved.

The third group of pasture trials would imply occupying plots of highly fertile irrigated land for pastures using European examples in optimizing plant varieties and composition and the use of fertilizers.

### 6.2

#### Crop trials

Where climatological conditions are concerned the Badakhshan Province is rather unfavourable compared to the neighbour province of Kunduz. The short growing period implies that certain species be grown on the fielts, the elevation of which is higher than 2000 metres. There is obviously a need for trial activity to optimize the use of fertilizers and the corresponding irrigation time for the different species. Such trials have been executed in Kunduz and the results may be applied to the western part of the Badakhshan Province.

It is proposet that a state farm is established in Keshem and Jurm for experiments with certain species and brands. The most

common soil and irrigation factors of the woluswali should be well represented on the farms. Should conditions on these farms not correspond to those in Eshkashem and Wakhan areas a minor experimental farm should then be established in the area of Khandud or Qala-i-Panja.

### 6.3

#### Fertilizer experiments

Demonstration fields for fertilizer use were used about ten years ago. The use of fertilizers is becoming more common and thus extension work requires special attention.

The results obtained from fertilization experiments in Kunduz imply that potassium fertilization is hardly necessary. To verify the suitability of results from outstanding trial plants, regarding conditions in Badakhshan it is intended that field experiments be carried out on the proposed state-owned experimental farms in Jurm and Keshem. These experiments would serve the extension work by giving the personnel an opportunity of more frequent close contact with experimental work and its results. Moreover the results may be presented "in more reality" to the farmers. Suitable experimental schemes may be obtained from the Baghlan experimental station.

### 6.4

#### Emergency storage for wintertime animal feeding

Animal losses are reported by farmers every winter; during the severe winter 1963-1964 five million sheep were lost in Afghanistan. Since the main cause is the shortage of food in winter losses could partly be eliminated by storing more hay and barley for the animals of each farm.

The technical sectoral report "Animal husbandry", states as a matter of urgency that one fodder store should be built for each of the six woles-walis and wheat and barley seed stock-piled. The local authorities should be provided with sufficient funds to maintain the planned stores of animal feed at harvesting time. The distribution of animal food should be carried out at reasonable prices and purchases should be repayable in the form of corresponding products in the next harvesting season.

Once the farmers have learned and agreed to store the required quantities of fodder, the stores could be transformed into local grain stores. Farmers' co-operatives should be established to maintain these. The idea of forage mixture stations could be planned and implemented in this connection and this could be taken into account when planning the stores.

## 6.5

Agro-Mechanization

Transportation has a considerable economic impact on farming. Within the individual farms low-valued but large and heavy masses must be moved between different places. These include moving fodder from the fields to the stores and grain from the threshing bases to the barns and places of consumption. Dung must also be transported to the fields, products to the market and materials to the farm.

By mechanizing transport where possible appreciable savings in terms of fodder and pasture could be obtained for actual production. Those farms which have fields connected to both pedestrian and motorable tracks could reduce the number of transport animals or could establish a system of service exchange with neighbouring farms.

The traditional western activities for a tractor comprise ploughing, tilling, sowing and harvesting as well as all kinds of transport connected with the increasing use of vehicles equipped with tyres. The irrigated plots in Badakhshan are of small and irregular pattern, which makes the use of machinery difficult and time-consuming. The enlargement of plot areas and the parallelization of their contours require earth works and changes in many traditional views, even landownership legislation to enable plot transfers. The application of these principles should be included in the activities of experimental farms.

Tall structured carriages equipped with rubber tyres and driven either by horses or humans are used in the Keshem areas. This could be considered as the first step on the path to mechanization. Terrain conditions and connection routes could possibly be completed at very modest costs in many valleys. This would make most fields, especially irrigated ones, accessible to tractors. Combined harvesting could be justified in dry farming in the low featured western parts of the province because it is well-suited even for harvesting the most dwarfed yields.

Utilization of electric energy on the farms would enable a higher rate of value added before marketing. Distribution investments imply, however, long-term, low-interest loans and distribution co-operatives should be established. Investments in consumption facilities and the subscription fees could make many farm economics unprofitable. If farms are to be mechanized and electrified, attention should be paid to defining the optimum size of the consumers' co-operative units. The share of investment costs in the total costs may be minimized only by sufficient annual consumption. Thus, after the willingness and feasibility of certain villages have been analyzed, the number of neighbouring farms which could be combined to form an electricity

consuming co-operative or the number which could support a mechanization centre should be determined or alternatively individual farmers who would purchase machinery for themselves.

Hand tools used in Badakhshan are mainly home-made, wooden tools, which may have iron parts such as the reinforcement in shovels or the entire spade, and in ploughs the iron tip of the bill. The last-mentioned are cast from scry iron in Fayzabad. Hand tools are traditionally quite rough and they are generally also in a very worn-out condition. No scythes or rakes of any kind were observed.

Agro-mechanization in its broadest sense includes all measures facilitating and speeding up the work in the fields. In this connection the following development objects should be considered:

- Farmers should be provided with simple, well-designed hand tools such as hoes, shovels, spades and sickles. New tools such as scythes and rakes should be introduced. Some new cheap equipment for threshing and milling are at present being developed and used in the Paktia handicraft development centre. A similar effort could be made in Badakhshan.
- A state demonstration farm should be established, which should be provided with tools considered suitable for local conditions in order to assess their actual suitability.
- Production of the approved tools should be organized as well as distribution and instruction in use.

## 6.6

### State farms

Experimental farming should be carried out every year in two localities: Keshem and Jurm. For this purpose two farms to be managed by the government should be acquired. These farms should engage in land use activities typical of Badakhshan: irrigated and dry farming, grazing, forestry and gardening. Moreover double cropping should be experimented with in Keshem and alpine farming in Jurm paying attention to cultivation conditions of Wakhan.

The experimental crop surveys, fertilizer experiments and grazing surveys mentioned separately in this report, could be carried out on these farms. Where seedling production for fruit trees is concerned, a nursery is already in operation in Jurm. This nursery should be improved for the diversification and expansion of garden survey if it is not selected as the site of an experimental farm and thus supported in that connection.

The state farms should maintain a small number of cattle in order to increase diversification and obtain animal manure for experimental activities.

One task of the state farms would be to support the extension services. The farms should be provided with traditional though old-fashioned equipment, buildings and methods together with modern ones so that the agricultural concepts could be demonstrated by examples.

Accommodation facilities should be included for long-distance visitors and in order to enable the organization of course and seminar activities.

## 6.7

### Afforestation of uncultivated fields

According to the 1967 census there are about 590 sq/km fallow fields. This amount indicates that the resources available for cultivation activities are not sufficient in respect of the total area that has been cleared and used for cultivation. The possibility to afforest part of these fields should be considered.

In the Badakhshan province forests also serve as grazing areas. The fields that are not suitable for cultivation could be changed to pasture by planting Russian willow as a pioneer plant. To ensure good results the area should be protected with a fence for some years.

It is tentatively proposed that field inspections be carried out with the farmers in order to determine the fields suitable for afforestation. A demonstration plot should for instance be planted in connection with the proposed experimental farms (see chap. 6.2 and 6.3).

## 6.8

### Farmers' co-operation

The farmers are dependent on the merchants for purchasing and selling when their liquidity is poor. Trade is generally based on cash purchase. External credits are used for purchases of fertilizer and these are arranged through the Ministry of Agriculture and Irrigation. In some regions the farmers give loans to each other and also barter with commodities.

While the financing system is quite undeveloped the farmer may have to sell his products at a low price when he needs money urgently. Likewise the price of certain commodities can rise very high for "last minute" purchases.

The merchants are interested in buying products in larger quantities and of homogenous quality generally. Since the average farm size is about 2 - 3 hectares, quantities are small. This leads to additional costs for all parties concerned.

Trade with larger quantities implies co-operation between the producers. The division of labour on a larger scale is recommended. In this way production will be concentrated and this will facilitate a larger quantities at the selling time.

Co-operatives have proved to be one of the most fruitful forms of co-operation. They aim at concentrating trade, easing financing and developing quality control. The producers co-operative societies should establish co-operative banks. Equipment pools could also be established to promote mechanization.

## 6.9

### Manure in fuel supply and fertilization

The supply of fuel is not exclusively dependent on wood (see Forestry report). Other sources are the remaining brushwood and dry plants in the pastures and cattle dung. The dung is baked to form bricks with straw and the sundried. The bricks have a very good heating capacity, which is almost equal to firewood in dry matter. The use of manure as such for fertilization is not always economical.

- The nitrogen losses in manure are great, even though storage is appropriately arranged.
- Potassium is excreted in manure and urine. The soil, however, contains sufficient potassium.
- The seeds of weed plants are distributed in the manure out on the fields.
- When the manure rots in the soil, it absorbs some nitrogen from the soil. This nitrogen is not available during one growing season and should be compensated by fertilizer.

If the manure is processed into fuelbricks and burned and the ashes then used as fertilizer on fields, the advantages of manure use remain.

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## LIVESTOCK AND ANIMAL HUSBANDRY

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## LIVESTOCK AND ANIMAL HUSBANDRY

### 1. ORGANIZATIONAL BACKGROUND

#### 1.1 Organizational framework

Animal husbandry and veterinary service are administered by a department of the Ministry of Agriculture. The department is headed by a general director.

The Ministry of Education is responsible for the schooling of veterinary personnel. A diagnostic unit is located in Kabul no local diagnostic units have yet been established. The unit in Kabul has departments for Urnology, Bacteriology, Pathology and Parasithlogy.

Six types of animal vaccines are manufactured in the country, namely: anthrax blackleg, enterotoxaemia, sheep pox and two types of newcastle disease. Vaccine against rinderpest is imported. Lack of funds is the main reason why basic medicines may be imported only in a limited amount.

#### 1.2 Local organization

The agricultural officer in the Province of Badakhshan has one animal health assistant and four helpers at his disposal. This team is responsible for all the veterinary activities in the Province.

In the field of animal husbandry activities have not yet begun.

#### 1.3 Legislation

No written legislation on animal diseases or pasture rights exists. Pasture rights are based upon old traditions.

### 2. PRESENT SITUATION

#### 2.1 General

The Province of Badakhshan is considered poorer than the neighbouring provinces and thus the potential to increase the use of land for cultivation and grazing is limited. The present situation is that people from other provinces are to a large extent using the natural resources of the Province. It therefore seems justified to protect available resources for the local population.

## 2.2

Sheep and goats

## 2.2.1

Number of animals    The Ministry of Agriculture has given the following figures for sheep and goats in the Province:

|                    |         |
|--------------------|---------|
| Karakul Sheep      | 3 000   |
| Sheep, not Karakul | 378 000 |
| Goats              | 253 000 |

These figures represent the number of stationary animals. However, it must be stressed that the numbers given above are by no means exact, only a guide.

In addition to this, the Province is invaded every summer by an unknown number of both nomadic animals and animals belonging to settled people in neighbouring provinces. The estimated number of these animals is some 1 000 000.

The total number of sheep and goats is thus close to some 1 700 000 during the summer period.

## 2.2.2

## Sheep breeds

Different types of sheep breeds of the fatty tail type are represented in the Province. No detailed observations on variations were made during the visit to the area, however, a special type of sheep called Gedik was observed in the Wakhan area. The Gedik sheep are small sized and the fatty tail is undeveloped, but not completely absent.

The breed is very prolific and twins are common. The lambs can be served already at an age of six months. Gedik sheep are obviously a product of crossing short-tailed turcoman sheep with fatty tail sheep.

As the fatty tail sheep can be served one year later than the turcoman type it seems constructive to proceed with the breeding of the Gedik sheep with the goal of combining the size of the fatty tail sheep with the early maturity and high fecundity of the turcoman type. The improved nordic breeds are of the same sizes as fatty tail sheep.

## 2.2.3

## Feeding and housing in intertime

In general sheep and goats are supposed to find their feed in wintertime outdoors. If snow covers the soil, some additional feed is provided. Available feed consists mainly of wheat straw, wild grasses picked up along hill slopes and very occasionally alfa-alfa hay. Stores are generally insufficient, and if the snow cover lasts a few weeks longer than normal heavy losses among

the animals occur. On several occasions losses of up to 80 % of the total number of animals were reported. Losses of the mentioned magnitude are expected to occur once or twice in a ten year period. It is customary to keep the animals in the open all the year round. This increases the amount of energy needed to keep the body temperature at normal level. Well-fed animals do not suffer from cold, however, the major part in the Province are not well fed, which means that losses occur partly because of this.

#### 2.2.4

##### Pastures and land use

Figures given by the Ministry of Agriculture indicate a total area of 580 000 hectares 181 800 of which are estimated as cultivated and 312 000 pasture. Some 86 200 hectares are more or less impediment area. The condition of the pastures has deteriorated severely during the last ten years as a result of a continuous increase in the number of animals arriving in the summer time from other provinces. Overgrazing is thus severe and obvious.

In the Pamir area, however, pastures are still in good condition. Because of the remoteness of the area no migrant sheep use the pastures of this area.

#### 2.2.5

##### Sheep diseases

Losses among new born lambs were reported to be severe. According to information given by the shepherds it seems clear that the most important factor causing lamb death is the poor condition of the ewe at the time of parturition. The role of possible chlostridiosis could not be certified because of lack of information. Sheep and goat pox (tsitsyaki gusfaud) was reported to be one cause of death in all the parts visited. Among lambs, losses were of magnitude 50 to 90 %.

The older animals have obviously acquired resistance to the disease because they do not suffer from it to any great extent. With the huge number of migrant animals entering the province in summer time and the high contagiousness of pox, it is not surprising that epidemics occur frequently.

In addition to losses of animals, it should be borne in mind that the skins of survivors, especially goats, are useless for tannery purposes. In this way also losses in economic values occur. Anthrax was reported to occur locally. Enterotoxaemia of all common types occur. The significance of these diseases was not investigated.

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In the Wakhan area losses were reported which from the symptoms described appeared to be caused by Agalaxia. The disease is caused by riccezia, which causes keratitis, polyarthrititis and mastitis in the animals. The disease has not been studied thoroughly but is supposed by some authors to be tick-borne. If so, tick control by dipping should restrict an outbreak. More information about the disease is needed.

Foot and mouth disease occurs periodically. At present very little can be done to check the disease.

Echtyma contagiosa has earlier been reported in the FAO Report No. 1173 on the Control of Animal Diseases. The disease was not seen during the trip. Veterinary personnel should be instructed to use the vaccination with infected crust in a scratch inside the thigh of the lambs to avoid infection of the mouth, which makes it difficult for them to suckle.

Liver Flukes: On occasion the livers in the different bazaars were inspected. Some cases of liver fluke infestation were seen, but the majority of the livers were clean. In some villages the people complained of losses caused by flukes. Intestinal nematodes were reported especially in the Wakhan area. The parasite problem needs more clarification. Echinococcus was seen in Keshm.

## 2.3

### Cattle

#### 2.3.1

Number of animals According to figures given by the Ministry of Agriculture there are 127 000 cattle, 1 000 buffalo and 760 camels in the Province. The figures must be regarded as orientative. No subdivision into working oxes, cows and calves has been prepared.

In the Pamir and Wakhan areas an unknown number of yaks and crosses of yaks and cattle are kept. The pure yaks are used as pack animals and as riding animals, in the high mountain areas where no other animals can go. The yaks are too wild for ploughing and produce a small amount of very concentrated milk. Crosses between yaks and cattle are said to be the best ploughing animals available.

#### 2.3.2

### Cattle breeds

The local cattle breed is small in size and usually in poor condition. The milk yield was reported to be four litres/day maximum, generally only 1 - 2 litres. If a cow becomes pregnant again within the same year, the milking period is reported to be about six months. Usually cows do not conceive again during

the year of parturition and may produce milk somewhat longer than six months. The farmers were well aware of the fact that the long intervals between pregnancies are caused by poor feeding.

The calves are allowed to suckle after milking is finished, but they are, nevertheless, starving. Calf mortality on the other hand was said to be low. The calves are often in miserable condition and cannot be served before the age of 3 years.

The main importance of the cows is to produce working oxen. Cattle are regularly fed to some extent indoors during the winter.

### 2.3.3

#### Cattle diseases

Black leg was reported to be common in all places visited and to cause heavy losses. It is not quite clear if the diagnosis was correct on all occasions. Confusion with anthrax may occur.

Anthrax was reported to occur locally. The frequency and importance of the disease could not be determined.

Foot and mouth disease occurs periodically.

Tuberculosis occurs to an unknown extent.

Fasciola hepatica was reported in several places.

Echinococcosis was seen.

Hypodermatitis bovis, a parasite causing heavy losses for the tanning industry, is widely spread.

### 2.4

#### Poultry

Poultry are kept only in small numbers in a primitive way. During the last years Newcastle disease has caused heavy losses.

### 2.5

#### Horses and donkeys

Horses and donkeys are reported to number 21 000 and 57 000 respectively. No mules were seen during the visit to the area.

### 2.6

#### Meat and milk production

No quantitative estimates may be made due to lack of information on meat and milk production. However, no milk was sold in the market places, because the small number of cows did not produce milk in excess of the keeper's own needs.

### 2.7

#### Skin and hide production

Skin and hides will be discussed in the Sectoral Report "Handicrafts and Small Scale Industries", pages 60 to 76.

### 3. LIVESTOCK DEVELOPMENT AND PRIORITIES

#### 3.1 Sheep production development

##### 3.1.1 Estimation of losses

As already mentioned in earlier chapters great losses in sheep keeping are reported. In order to get an idea of the economic values involved an example is given below.

A conservative estimate, based upon reports given by local people, indicates that some 160 000 ewes may die during the spring. Assuming that one pregnant ewe represents a value of only 1 000 Afs. the total loss represents a value of 160 million Afs. If 320 000 sheep (1 ewe plus 1 lamb times 160 000) are fed with 9 kgs of barley each during one critical month in the spring (300 grams per day) this corresponds to a total of 2 880 tons of barley or in sers about 411 400 sers. The price for one ser of barley is about 35 Afs. the cost of the barley will thus be about 14,4 mill. Afs. The difference corresponds to 145,6 mill. Afs. This sum could be saved if necessary storage was available.

##### 3.1.2 Improvement of feeding in winter time

Improvement of feeding in winter time is one of the most urgent measures to be taken. Improvements should include at least the following:

- Protection against strong winds and snow.
- Feed stores, both private and Governmental.

Covered shelters can easily be built using local construction material. Some protection can even be achieved by simple brick or stone walls, without any roofing.

The best feed in winter time is alfa-alfa hay. Alfa-alfa grows well in the Badakhshan Province, but a shortage of irrigated land may cause difficulties in increasing production. The farmers need more information concerning the benefits of alfa-alfa hay.

Wheat straw is a very poor feed if given alone and yet in many places it is the only feed.

Barley is available and also easy to store. It has to be fed in crushed or ground form in order to avoid losses in nutritional value. A daily portion of some 300 grams is needed for each sheep, which means on an average about 9 kgs per sheep during

the critical period in the spring. Other good feeds are oilseed cakes, cotton seed and linseed, all of which are available in the Province.

An additional benefit in feeding the ewes well during the last stages in pregnancy will be the higher survival rate of new born lambs. The milk from the ewes should be given entirely to the lambs. In conclusion it may be stated that the shepherds and farmers keeping sheep should be informed in detail of the necessity of good feeding in winter time. Another way of solving the problem would be to establish governmental central stores in each of the districts of the Province. The capacity of these stores should depend on the number of sheep in each district, which means that an inventory of sheep should be carried out as soon as possible (See forward, Capters 4.1 and 4.2)

### 3.1.3

#### Breed improvement s

The Ministry of Agriculture is planning to establish a research station for sheep in the Province. When established a first priority of this research station should be the improvement of sheep breeds.

Special attention should be paid to the improvement of the gedik breed. The wool quantity and quality of the present sheep can be improved by selective breeding.

Improved breeding rams should be raised and sold to the villages.

### 3.2

#### Cattle production develompent

A traditional lack in dairy and fodder crop cultivation makes an immediate introduction of improved dairy cattle unsuccessful, although an increase in milk consumption would be very important for the people in the Province. As mentioned in Chapter 3.1.3 the Ministry of Agriculture is planning to establish a research station in the Province. This station could as one project include improvements in cattle breeding, however, on a smaller scale than sheep breeding.

The station could carry out experiments using cross-breeding with European dairy breeds of small size (Jersey and Ayrshire for example) using local cows as mothers. Cross-breeding with yaks should be tested. The possibilities of using artificial insemination should also be borne in mind.

### 3.3

#### Fodder crop farm

The Ministry of Agriculture is also planning to establish a farm for fodder crop production in the Province. The plan should be given the same priority as that of sheep research. Among many

other important investigation projects special attention should be paid to scientific research for local plants suitable for hay cropping without being grown in irrigated areas. Furthermore, methods to reintroduce good kinds of grasses extinct as a result of overgrazing should be demonstrated.

### 3.4

#### Industrial development

The Ministry of Planning has proposed the construction of a slaughter-house including facilities in Baharak. The plan should be strongly supported as substantial amounts of meat can be saved if the animals are slaughtered on the spot instead of being walked to Kabul thus losing a considerable amount of weight on the road.

If marketing is arranged in the proper way for example by co-operatives middlemen can be eliminated and the part of the value belonging to the primary producer increased.

At the moment there are no milk markets at all because of low production. To improve the food quality of the people a considerable increase in milk production is desirable. But lack of feed production and minimal possibilities to increase it excludes the feasibility of a dairy plant at the moment.

### 3.5

#### Veterinary development

At present one veterinary health assistant is stationed in Fayzabad together with 3 - 4 helpers.

Because of the central role of the animal stock as a possible raiser of the living standard of the people more attention should be given to the prevention of heavy losses caused by diseases.

Emphasis should initially be on the following diseases: Sheep pox, Scab and Ectoparasites in sheep and goats, black leg in cattle, anthrax in all animals, where present, Newcastle disease in poultry.

### 3.6

#### Legislative improvement

Law on Animal Diseases:

At present Afghanistan lacks legislation on animal diseases. Many diseases need prompt and strong action to be checked quickly. It should be possible to interfere with the activities of the individual in many ways and that is not possible without legislation. The question is extensive and needs careful planning. In this connection only the urgency of the matter can be stressed.

### Law on Pastures and Grazing Rights:

As long as pastures are abundant the old traditions of Afghanistan are justified, with growing population and continuously decreasing pastures, free rights to pastures will no longer be possible. The heavy overgrazing prevalent at present will destroy the pastures in a short time.

The only way to improve the situation is to implement legislation dividing the pastures among the local villages. In the beginning it will, of course, be necessary to allocate land to migrant animals, but the areas should be strictly determined in advance.

As far as Badakhshan is concerned it seems necessary to cut down the number of animals entering the province each summer. This might be possible by making entrance dependant upon written permission determining the number of animals and strictly restricting the areas allowed for foreign animals.

## 3.7

### Pasture Improvements

As proper legislation on pasture rights is implemented and the villages have their own pastures it should be possible to arrange rotational grazing. If properly implemented this should increase the carrying capacity of the pastures considerably within a few years time. The advantages would be better fed animals with increased possibilities of survival and giving birth to healthy lambs. Fecundity will also improve.

By extension work the farmers should be motivated to keep the number of animals on a level in balance with the carrying capacity of the land.

## 4. RECOMMENDATIONS FOR DEVELOPMENT PROJECTS

### 4.1 Animal census

The number of animals should be determined as accurately as possible the stationary animals in one group and the migrant ones in another group.

Accurate information can be achieved by aerial photos taken during the pasture period. The method is fast, but expensive. If compulsory vaccinations can be arranged, these provide a good opportunity to count the animals at same occasion.

Questionnaires to each village may be used, but results are not absolutely reliable in this case.

For migrant animals, counting stations along the routes can be used. In addition to the number the origin and the destination of the animals should also be determined.

#### 4.2

##### Animal migration survey

Proper planning of vaccination and dipping programmes should start as soon as facilities such as funds and personnel are available. These programmes require a good knowledge of the migratory routes. The easiest way to collect such information is by aerial observation.

#### 4.3

##### Botanical investigation of pastures

Botanical investigation of pastures is a natural part of the work of the planned fodder crop research station. In the beginning the help of a well-educated botanist is needed.

The plant families, Graminae and Leguminosae, should be given special attention. In addition wild spices and medical plants should be collected.

Plants used by the local population for special purposes should be carefully studied. Useful plants have often been found by local people and later played a big role in, for example, medicine.

#### 4.4

##### Economical survey of winterfeeding

Because the salvation of starving animals during the critical months in spring seems to be a question of utmost importance, the economy of different ways of emergency feeding as well as the availability and physiological feasibility of different feed-stuffs and their combinations require far more investigations and field studies.

#### 4.5

##### Animal health survey

Present information about the animal health situation in Badakhshan is sporadic and collected partly by questioning shepherds and farmers. A complete field study carried out by a veterinarian during the spring and summer is required.

#### 4.6

##### Vaccination programmes

Conducting a field study into the animal health situation the veterinary officer is also in a good position to find out the urgency of different vaccinations needed to control the most important infectious diseases. Some geographical plan of action may also be attainable.

## 4.7

Development in dip use

At the moment lack of funds makes the use of the already existing sheep dip near Keshm impossible. The need for a dip is obvious and it is to be hoped that, for example, some international organization could provide the funds lacking. Additional dips are also necessary. Some small "portable" dips for use in severely infected herds are also needed.

A good construction location for a permanent dip is in the vicinity of the bridge in Fayzabad.

## 4.8

Development of veterinary services

Satisfactory veterinary services are most important if the present heavy losses caused by diseases are to be brought under control. The premises for satisfactory services are a sufficient number of trained personnel and technical working facilities for these. As a sensible first goal it is proposed that one veterinarian as head of the veterinary services in the province and six animals health assistants, one for each of the districts, are employed immediately. These trained people should be helped by the necessary number of unskilled workers. If provided with jeeps, vaccines and medicines those persons could provide services completely unknown at present.

## GEOLOGY

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## GEOLOGY

### 1.1

#### General

The Geological Survey of Afghanistan was established in 1955 and in that year geological soil and bedrock mapping together with mineral prospecting started on a formal basis. Mapping activity to date has comprised reconnaissance mapping directed to produce a geological map of the entire country, scale 1:500 000. Furthermore, detailed mapping on a larger scale has been done at specific mineral occurrences.

Coverage on a scale of 1 : 1 000 000 is completed and available. This map is also published in scale 1 : 2 500 000 in the publication "Geology and Mineral Resources of Afghanistan". (ref. No. 1). Because of this and also due to the fact that both mapping and mineral prospecting are still continuing, the geology of the Badakhshan area will be discussed only briefly in the following.

The main emphasis of this chapter will be laid upon geological and engineering geological features relevant for practical purposes and further developments in this field. It is, therefore, assumed that e.g. the scientific part of the geology of the Badakhshan area is available in detail to the reader in the mentioned publication. However, some geological features of the Province will be discussed in the following chapters.

### 1.2

#### Recent deposits

Recent deposits (quaternary deposits) are located mainly in river valleys and depressions in the topography.

The origin of these deposits is normally fluvial, fluvio-glacial or colluvial. To a certain extent, mostly at high altitudes, recent deposits are also formed through different weathering phenomena (cold weathering) and erosion (wind and water).

The grain size composition of these deposits varies to a very large extent, even within very short distances. In the mountainous area there are recent deposits containing boulders ranging up to several cubic metres in size, while in the low elevation areas grain sizes from small boulders to clay fractions dominate.

The rock types occurring in these formations are in general very resistant to abrasion which indicates the predominance of mainly precambrian rock types. The degree of roundness of pebbles, cobbles and stones is normally high which indicates that the transportation distance of the river valley sediments has been fairly long. On the other hand the degree of roundness of material is local. Recent deposits in the Badakhshan area are thus as

## PREFACE

This report is Volume No. III out of three volumes , viz.:

- |            |                                                            |
|------------|------------------------------------------------------------|
| Volume I   | MAIN REPORT<br>MAPS AND TABLES                             |
| Volume II  | PROPOSALS FOR DEVELOPMENT<br>PROJECTS AND PROGRAMMES , and |
| Volume III | SECTORAL REPORTS                                           |

The sectoral reports have been prepared in October - November 1975 by the following Finnconsult experts:

- |                         |                                        |
|-------------------------|----------------------------------------|
| Mr. Kalevi Virri ,      | Crop Production                        |
| Mr. Gösta Broberg ,     | Livestock and Animal Husbandry         |
| Mr. Stig Johansson ,    | Geology                                |
| Mr. Matti Meriluoto ,   | Forest Resources                       |
| Mr. Antti Salmela ,     | Handicrafts and Small Scale Industries |
| Mr. Matti Rantala ,     | Water and Power Development            |
| Mr. Jukka Rausti ,      | Public Health and Education            |
| Mr. Björn Silfverberg , | Transport and Communications           |

This Finnconsult team was led by Mr. Markku Visapää , Project Manager , who had Mr. Erkki Hietanen as his assistant .

All maps and tables , originally attached to these sectoral reports , are presented in Volume I .

In May - July , 1976 , a minor Finnconsult team prepared the Main Report consisting of Volumes I and II . More detailed background information can be found in the preface of Volume I .

The Sectoral Report prepared in phase II by Mr. Pekka Hamalainen has also been attached to this volume . This report contains supporting information to the road construction projects proposed in report Volume II .

follows: Loess, Loam, Clay, Silt, Sand, Gravel, stones and boulders. The consolidation degree of these formations is rather low and the formations may easily be used for different technical purposes, such as raw material sources for construction purposes hydrogeological and agrogeological purposes, (see Chap. engineering geology, ground water sources and agrogeology).

The thickness of the recent deposits varies to a large extent, depending on a lot of factors, but generally taken the average maximum thickness of coarse-grained deposits is under 10 metres while the thickness of fine-grained sediments like loess and clay may be up to 50 metres in thickness in low level and smooth topography areas (low lands).

### 1.3

#### Bedrock

The main tectonic magmatic features of the Badakhshan area including geological age and rock-types are described in detail in different geological works, the most recent being Geology and Mineral Resources of Afghanistan. It is, therefore, considered sufficient to give only a very brief summary of these in this report.

In the area of Pamir and Wakhan Archean Gneisses, Carboniferous - Triassic aleurolite, Slate and Sandstone with Lenses and interbeddings of conglomerate and limestone, and Cretaceous - Paleocene granites and granodiorites are found.

In the northeast part of Kohe Hindu-Kush Archean Gneiss schist crystalline schists quartzites, amphibolites and marbles, Vendian-complex - Ardovician sates, phyllites and metamorphosed sandstones are found. The area also contains Triassic slates with interbeddings of sandstone limestone and dolomite together with various masses of Oligocene granite, grauosyenite and granodiorite.

The geological picture in the central and northern part of the Province is rather complex. The following formations are met with: Archean Gneiss and schist crystalline Schists, Vendian, Ordoivician slates, phyllites and metamorphosed sandstones, Silurian, Devonian limestones with different interbeddings, Carboni-Ferous, rocks, slates, sandstones aleurolites, limestones and conglomerates, Permian aleurolites and sandstones with interbeddings and Triassic - Jurassic sandstones, slates and aleurolites with interbeddings of conglomerates together with Oligocene granites granosyenites and granodiorites. In the western part of the Province a very complex formation of Pliocene age occurs composed mainly of conglomerates, sandstones, siltstones, clays and sands, in places thin lenses of gypsum and salt also occur. Most of the rock types and formations mentioned are in many regions tectonically strongly folded, fractured, fissured and faulted.

Geological maps of the Province are presented in Appendixes 1-2.

## 1.4

Mineral resources

A number of different minerals are reported to be found in the Badakhshan area, the most significant being gold, lead and zink and lapis lazuli (lazurite). Due to the fact that mineral prospecting on a larger scale has not yet started in Afghanistan, the reported mineral findings indicate good possibilities to discover mineral sources of economic value. A brief summary of the main findings is presented in the following:

## 1.4.1

## Gold

Auriferous ore occurrences formed in connection with late Permian-Early Triassic granitoids are found within the Faizabad area, where these bodies appear to be confined to zones of fracturing in bed-rock and to intense silification developed in Pre-cambrian Metamorphic formations. Within the area of Merzoyan consolidation the highest concentrations of gold are met.

Gold has been found in the drainage system of the Darya-i-Panj River, where the gold is located in the banks of the recent river and the banks of an ancient uplifted river drainage system. Gold has been found in alluvial, channelled, valleys and terrace type formations. As main sources of gold are the Mid-Quaternary conglomerates filling an ancient valley elongated in meridional direction from the left slope of the Panj valley up to the upper courses of the Yangi-Qala Valley. Within the central Panj region seven locations have been investigated in more detail, the largest one being in the Panj valley. However, further prospecting and exploration works are needed before any decision on mining can be made.

Also in the River Darya-i-Kokcha gold is washed at some four locations in the region between Faizabad and Keshem. The washing procedure studied by the team during their visit to Badakhshan area was technically ineffective, but obviously gave enough results to be economic for the workers.

## 1.4.2

## Lapis Lazuli

The Sary-Sang deposit of lapis lazuli (lazurite) has been known for a very long time. Mineral deposits and ore occurrences of lazurite are widespread in the Kokcha river system. The lazurite zones are confined to carboniferous rocks injected by a great number of veinlike bodies of alaskitic granites of the s.c. Kokcha complex.

In the contact zones between granites and dolomites or calcite marbles as well as away from these contacts veins of lapis lazuli occur in the fractured rock. The extent of such zones varies in general from 20 to 120 metres, the maximum length of the zones discovered is 450 metres. The thickness of the zones varies from about 0,5 to 4,0 metres, the content of lazurite varies from 1 to 15 % of the volume of the mineralized zone. The hardness of the lapis lazuli is 5,5 - 5,8 and the specific weight from 2,4

to 2,95. Very often lazurite contains small fragments of pyrrite thus giving a goldlike look to a polished specimen.

Commercial production of lapis lazuli started in 1934, mainly for jewelry gem stone purposes. Mining is confined to some four months of the year due to severe climatic conditions. Annual production ranges from 4 000 to 6 000 kilogrammes and the final product is classified into six grades in accordance to purity.

Prices in Kabul range from about US \$ 265 (15 000 Afs.) for grade one down to about US \$ 5 (300 Afs.) per kilogramme for grade six. (Price-level 1972) The value of the annual production is thus some US \$ 500 000 (30 mil. Afs.) assuming an average price of about US \$ 100 (6 000 Afs.) per kilogramme.

The mining procedure has been to pick away the mineralized zones with a gang of workers and then transport the product some 20 kilometres by animals to the closest motorable track and from there by truck to the destination point.

There has been very little assesment of reserves or the location of high quality grades. The Ministry of Mines and Industries is planning to launch an exploration programme mainly by driving tunnels into the mineralized zones with a view to develop ore reserves and a more rational plan of mining.

At present 27 mineable occurrences of lazurite have been reported in the Sary-Sang region some 5 of which are mined by open pit method using manual methods.

Afghanistan possesses probably the largest and best quality reserves of lazurite in the world. Accordingly the Government could develop a strong market strategy. A sound assessment of market demand and production to meet this demand as well as market development could result in a considerable expansion of the market.

The Sary-Sang deposits, except for lapis lazuli demand for jewelry, also disposes of great reserves for facing stones of very effective colouring. This fact should also be taken into consideration in planning the further development of the area. At present access to the area is very difficult and severe climatic conditions prevent all the year round mining.

A motorable road and good living conditions are, therefore, needed in the future, in order to be able to develop lapis lazuli mining.

## 1.4.3

## Rock salt

The most important rock salt deposit mined in Afghanistan is the Namakab deposit in the vicinity of Taloqan, somewhat outside the western border of the Badakhshan Province.

Most rock salt deposits here occur within the Epi-Early Cimmerian platform deposits, and are confined to gypsiferous deposits of Upper Jurassic age. The rock salt met in these deposits has a grey to reddish brown color, and contains a considerable amount of different impurities mainly sand, silt and clay particles. The NaCl content is thus often very low ranging from about 20 to 85%. The rock salt deposits at Taloqan are being mined at a rate of about 20 000 t.p.a.

In the Badakhshan area rock salt was recovered from small deposits in the form of blocks and transported to the market places for sale. It could be clearly stated that the rock salt in this form contained a huge amount of different impurities like solid particles and obviously also some gypsum and sylvine (KCl). The main part of the salt was used by the inhabitants for tanning purposes. Due to high transportation costs in certain areas of the Province the price of one kilogramme of salt was 5 times higher than in areas with local salt deposits, where the price was around 2 to 4 Afs. per kilogramme.

The use of unpurified salt in certain cases may lead to severe stomach illnesses and people should, therefore, be well informed of this fact.

Current salt consumption per capita is about 1,7 kg per year, which is about three times less than consumption in e.g. Iran. Consumption of purified salt should, therefore, be raised, as the salt reserves of the country are very good, (e.g. the Taloqan deposits contains 300 mill. tons of salt).

## 1.4.4

## Other minerals

Other minerals found in Badakhshan Province are lead, zinc, fluor, aluminium and lithium. The occurrence of jewelry stones such as garnets, topaz, beryl etc. has also been reported.

In Appencix (3) a map is presented indicating the main mineral occurrences.

## 1.4.5

## Suggestions for developing mineral prospecting

The current mapping and prospecting work could continue for several years without the discovery of economic deposits since the approaches seem to be more on a scientific than an economic base.

Alternative approaches should be worked out at Governmental level. These should include for example airborne geophysical prospecting followed up by ground geophysics including also radioactive mineral prospecting. Furthermore, the population itself could be encouraged to carry out mineral prospecting in the way of s.c. laymen sampling, a method which in Finland primarily has lead to the discovery of a number of mines. Laymen samples could be examined at the Geological Survey in Kabul or at a local geological department in the Province, for example in Faizabad. This suggestion, however, calls for careful and detailed planning before establishment.

Teaching and training in mineral prospecting could also be included in the childrens' curriculum in the schools. Courses for adults in prospecting could be arranged in different centres of the Province.

These short note suggestions are considered useful as the general geological features and the minerals findings up-to-date are encouraging for further studies.

2.

HYDROGEOLOGY    The Hydrogeological report is presented separately.

3.

ENGINEERING GEOLOGY

According to information obtained engineering geological studies have not been carried out in the Province. The engineering geological conclusions presented in the following are thus based only upon ocular field-studies along roads, during the team's visit to the area.

3.1

Soils

Porous Loess and loam formed in the Pleistocene time together with cohesional soils (clay and silt) are the most important from the geotechnical point of view. Loess, for example, is very sensitive to erosion from e.g. heavy traffic, even in the dry season. Clay and silt soils are normally stable during the dry seasons, but easily loose most of their stability when being water saturated.

## 3.2

Raw material sources

The main raw material sources for different construction purposes such as roads, airfields, bridges, dams, irrigation canals, buildings houses etc. are best found in the banks of the larger rivers, like Darya-i-Panj, Darya-i-Kokcha, Darya-i-Keshem and in the main tributaries to these rivers. In some places also outwash plain material is well suited for the purposes mentioned.

The thickness of these deposits varies very much, on an average the thickness is some 3 to 5 metres, and the maximum thicknesses some 10 metres. The total cubic amount of these material sources fully covers all future needs, and the material sources seemed to be spread fairly evenly over the river systems, thus making hauling distances fairly even also.

Suitable concrete aggregates are also present in the deposits. However, in most cases the material has to be processed by screening.

The geotechnical properties of these soils must be studied carefully and in detail in connection with different construction projects, like e.g. roads and bridges.

The engineering geological properties of coarse-grained sediments i.e. sand up to boulders, are good, as the sediments are formed to a high degree of rock-types highly resistant to all types of weathering phenomena and mechanical abrasion. However, as these sediments occur mainly in the form of river deposits and outwash plains, they often contain interbeddings and irregular lenses of fine grained sediments, which fact has to be kept in mind, when planning raw material sources for different purposes. The amount of very coarse-grained particles, mainly boulders, is at some locations fairly high up to 20% even to 50% thus making excavation costs high. Screening of such material is also needed.

## 3.3

Brick production

The normal way of making bricks is to mix locally available soil (clay, silt, sand) with straw and water, sometimes also using a mould to get the correct shape of the brick and then let it dry in the sun. The weather resistance of such a brick is often very poor, and the brick also cracks easily. Production costs of the brick-type are, however, very low, about 150 Afs. per 1 000 pieces which means that maintenance costs of constructions made of these bricks are very low.

Burned bricks are not common in the Province. During the visit one brickworks in Jurm was inspected.

At this brickworks some 15 000 bricks were produced at one time, using quicklime (calcium Oxide) as heating material. The baking time was ten days. The quality of the bricks was rather poor mainly because of wrong raw material composition (too sandy material was used) and to inexactness in the heating procedure.

The price per brick was reported to be about 1 Afs. According to other statistics it is possible to obtain baked bricks at a price of about 500 Afs. per 1 000 pieces (size 240 x 115 x 70 mm)

The quality of burned bricks and the brick work industry could be improved easily.

The following recommendations are made:

1. Before establishing a brickworks suitable raw material locations should be investigated. These investigations should include soil sampling to determine the grain-size distribution content of organic matter humus, plasticity indices and test brick baking to find out the optimum baking temperature.
2. The brickwork constructions should be improved in order to diminish maintenance and repairs.
3. The heating source should be improved. For example, the use of coal should be developed as this gives a more stable heat.

A good brickworks could also serve as a factory for drain pipes, needed in irrigation and in sewage, and furthermore, for making pots, jars etc.

### 3.4

#### Rock mechanics

Rock Mechanics field studies and laboratory investigations of rock-types occurring in the Province have not been carried out.

During the visit to the Province rock mechanical features were studied by ocular inspection, and the following conclusions may be drawn.

The rock mechanical stability of mountain and hillslopes is to a large extent dependent on local conditions like weathering degree, fracturing of rock mass, occurrence of slickensides and shear zones and wider fault-zones. Landslides in the form of rockfalls occur frequently, especially in spring time at many locations along the steep mountain sides. These phenomena cause severe problems especially along the roads in the area. One of the primary sources to these phenomena is melting water which rushes down the slopes at a very high speed.

However, in areas with magmatic rocks like granite or granodiorite and in areas with metamorphic rocks like gneisses and schists the above-mentioned phenomena occur more rarely. This is mainly because these rocks are resistant to weathering and the internal friction of fracture surfaces is high.

The rock mechanical stability questions must be studied carefully in connection with road planning and planning for hydro-power stations. The possibilities of landslides should also be observed in irrigation canal projects.

#### 4. AGROGEOLOGY

As already mentioned earlier the general topography of the Province is, to a large extent, mountainous especially in the eastern parts. A simplified map showing the topographic elevations is presented in general background.

The cultivated areas are mainly located in the lowlands, with elevations of less than 3 000 metres and mainly in the central and eastern part of the Province in river valleys and highlands. Gently inclined hillslopes (inclination under 1:1) are also widely cultivated in the surroundings of Faizabad

In the river valleys the cultivated areas are either in recent deposits (quaternary deposits) or somewhat older uplifted deposits of Pliocene age. In the highland areas shallow loess deposits of the same age occur and in the western parts towards the border of the USSR loess deposits ranging up to several tens of metres in thickness are reported.

The main soil types cultivated in the river valley areas are: loess, loam, clay, silt and fine sand. However, at many locations these fine-grained sediments contain a varying amount of coarse material like stones, pebbles and cobbles. Even small boulders covering the cultivated field up to 50 % or more could be observed.

Farming of such fields is, therefore, very difficult, to the limit of uselessness. In the highland areas the amount of coarse-grained sediments is generally low, and thus farming is easier to carry out.

The soil types cultivated along hillslopes are very indefinite, obviously these soils are to a very large degree composed of in situ weathered rock material and material transported by temporary water streams during spring time to the location. According to observations done in the field the content of organic material (humus) is generally very low. No assays for humus

on soils from the Province have been carried out. Nor has it been possible to obtain any laboratory test results on chemical composition of different soil types.

The stability of the cultivated areas in the river valleys and in the areas where the topography is smooth is good. However, rare high floods may cause severe erosion locally. The cultivated areas along gently steeping hillsides are very sensitive to both water and wind erosion.

Both dry farming and irrigation farming are used in the Province. In the attached sketch drawing (see appendix 1) the agricultural situation in the year 1967 is presented.

The present irrigation level is fairly low, although the Province possesses very good water reserves. Irrigation canals are constructed and maintained mainly using local material which means that the canals are sensitive to collapse during heavy rainfalls or high stream velocities of water. On the other hand these canal juils can be easily repaired. The chemical composition of 39 water samples taken at different locations were analyzed by the Water and Power Authorities in Kabul. The results indicate that all the tested waters were suitable for irrigation. Thus the possibilities for further development of the agricultural sector are very good in this respect.

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## FOREST RESOURCES

### 1. RESOURCES

The forests in Afghanistan are located in the eastern part of the country. Kunar and Paktia Provinces are rich in forests.

In Badakhshan the situation is different. The ecological map (Appendix) shows that a great part of the Province is in alpine and subalpine altitudes, where no trees grow. The rest is divided between pistachio- and juniperus- type of vegetation.

#### 1.1 Pistachio and Archa-forests

Pistachio (*Pistacia vera*) and archa (*Juniperus macropoda*) trees and bushes grow scattered in the mountains, pistachio up to an altitude of 2 000 m, juniper over 2 000 m. The name "forest" is used in this connection, but it is, however, an overstatement. Scrub-forest on brush would be better. Wild almond also grows in the same areas.

People collect pistachio-nuts and almond from these trees for food. The trees are also used for fuel wood. Often the trees are located in places where it is very difficult to reach them. When the trees are cut for fuel, they do not regenerate. The forest is destroyed for good.

Any other use for these "forests" than the present one cannot be seen.

#### 1.2 Walnut-forests

In Zardev-valley about 60 km from Faizabad there are quite a lot walnut trees. These trees are said to grow naturally, but, of course, it is also possible that some of them are planted by the people. The trees are scattered between cultivated fields and houses, and do not form any dense forest.

In some other valleys north of Faizabad walnut trees occur in the same way.

The walnut (*Juglans regia*) reaches a height of 18 - 25 m; the bole rarely exceeds 6 m in length. On wide boards three distinct zones are seen: the true heartwood in the middle, darker than the rest; the sapwood on the outside, much paler; between them an intermediate zone, often slightly pinkish-brown in colour.

The timber is highly valued for both its ornamental and technical qualities. The demand for walnut in Europe exceeds supply. The timber of fully matured trees is usually preferred to that of younger growth, as the former is of closer texture and has more heartwood.

The minimum commercial seed-bearing age of walnut is about 10 - 12 years, an optimum of 30 years and a maximum of 80 years.

These walnut trees in the Zardev-valley could be cut and used for raw material for a sawmill and sawn timber exported or used for local consumption. But there are several reasons against this kind of project.

#### 1.2.1

The walnut trees in the Zardev-valley produce nuts about 500 000 kg, which are exported, worth 10 million Afs. annually. This regular cash income is very important for the small farmers. Collecting nuts also gives employment to a lot of people. Present price is 150 Afs./7 kg.

It is very difficult to combine walnut nut and timber production. It is necessary to choose one of these alternatives as the main production line, and the other one can then be only a secondary line.

One of the main principles in development strategy will apparently be that projects should be favoured which benefit the greatest number of people. Cutting these walnut trees would be contrary to that principle.

#### 1.2.2

Tree ownership is not quite clear. In principle in Afghanistan all naturally grown trees are owned by the government. However, the Forest Department is not able to control the entire country, and illegal cutting is very common. There is no valid Forest Law on which ownership could be based.

In the case of the Zardev-valley the small farmers indisputably own the land. In Afghanistan a tax receipt is sufficient to prove ownership of land. The trees growing on that land are, however, considered to be government property.

This is an interpretation which is not common outside Afghanistan. Apparently the small farmers on whose land the trees are growing consider that they own the trees as well as the land. They are hardly willing to let the trees be cut, in which case they would lose the present annual income from nut sales.

#### 1.2.3

All the trees in the Zardev-valley could be sawn by a modern small size sawmill in a couple of years, but it would take 20 - 30 years to grow new trees.

#### 1.2.4

From an environmental point of view this valley should be protected against cutting. It is recommended that there is at least one green valley in Badakhshan.

Taking these points into consideration it is recommended that these walnut trees are not cut except in cases when the tree is too old for nut production or shadowing too much cultivated land. Obviously there are not too many such trees.

### 1.3

#### Mulberry-trees

In Jurm there are plenty of mulberry trees, and many other villages have these trees too. The trees grow to a great age; one 90-year-old tree was seen still producing fruit. The fruit is stored for winter and used by people for extension of food if the cereal crop is not enough. Only old trees are cut and used mainly for fuel. The wood could be used for tool handles and other purposes also.

There are therefore no real natural or man-made forests in Badakhshan, on which any kind of wood industries can be based.

## 2.

### PRESENT CONSUMPTION AND FUTURE REQUIREMENTS OF WOOD IN BADAKHSHAN

It was essential to look into the present wood consumption situation. The short time available did not permit any real consumption survey to be made.

Wood is used by households in Badakhshan for two main purposes:

- for fuel
- for building purposes

### 2.1

#### Fuel wood

All suitable trees (pistachio and archa) around the hills near Faizabad and along the nomad route are already used for fuel. Cattle and horse manure is generally used for fuel instead of wood. It should be preferably used in the fields for fertilizer.

In the countryside there is enough manure available for this purpose, but in Faizabad this means of fuel is of course in short supply. Fuel wood is brought to Faizabad by donkeys from a distance of 20 km or more.

The price of poor fuel wood is 14 Afs. per bundle of 3 - 4 kg, when the price of good fuel wood in Kabul is about 1,5 Afs./kg. The hauling distance and also the price of wood is increasing all the time. Fruit gardens produce some wood for fuel (dry branches and old trees), but the amount is very little. No other means can be seen in the near future.

Of course later on, there will be other sources of energy available in Badakhshan too, the best possibility being perhaps hydro-

electric power. But how can the poor people afford the high cost of electricity when they are short of cash income. And the electric cooker does heat the house. During winter the heating of the house is necessary, but using electric power for heating purposes will be too expensive. Wood will therefore be the most natural fuel for decades to come in Badakhshan. The shortage of fuel wood is a serious problem considering that at least 10 - 15 years are needed to grow wood for fuel.

## 2.2

### Wood for building purposes

The normal type of house in Badakhshan has the following wooden parts:

- pole rafters supporting the roof
- uprights if the roof is extended over some kind of veranda
- door frames and doors
- window frames and sash

There is generally no furniture inside the house. Altogether the use of wood is about 1 m<sup>3</sup> per small house.

In nearly all the villages along the Kotscha river small poplar plantations can nowadays be seen for growing poles for building purposes. Poplar needs quite a lot of water and so irrigated land is used for this purpose. That means that the land area is taken out from cereal cultivation. Irrigated land is in short supply in the province, and only the absolutely needed area should be used for tree-growing.

At the moment poles are readily available when needed, but the price is high. The production of poles is increasing all the time, as the poplar plantations are getting older. No shortage of poles can be seen in the near future.

What little sawn timber is needed is produced by handsawing willow, poplar and other logs. For more demanding work deodar squares are hauled all the way from Paktia Province, 1 000 km away. These squares are then sawn to boards.

### 3. RECOMMENDATIONS

The following projects in this field are recommended for detailed investigation and for inclusion in the Development Plan if found feasible in the detailed survey:

#### 3.1 Sawing facilities for old walnut trees

Old walnut trees, which are no longer producing enough nuts, should be cut and processed to sawn timber. In order to saw such trees fresh after cutting, some carpenter shop in Zardev-valley or in Baharak should be encouraged and assisted to procure the simplest form of diesel-driven portable circular saw.

Nowadays, such logs are lying around Faizabad and deteriorating gradually because there are no proper sawing facilities available in the locality.

#### 3.2 Fuel wood plantations

In order to secure the future fuel wood supply it is recommended that trees are planted for this purpose near Faizabad and near villages along the nomad route.

The first thing is to find a suitable species of wood. It can not be trees which need much water, like poplar, willow or platanus. Such land is simply not available.

The most suitable species seems to be Russian willow (*Ailanthus excelsa*), which is very modest where the growing place is concerned. It grows rather rapidly, however, taking 5 - 6 years to reach 12 cm DBH. The leaves have a bad smell, so that the animals do not eat them, which is also very important. It can be planted scattered on dry pasture slopes. That way it does not take any special land area. Pasture can still be used for grazing. It has a natural regeneration, so that once planted it grows again after cutting. Planting cost is 3 - 5 Afs. per tree.

This kind of fuel wood plantations could be very important for soil protection against erosion also.

This project is very long-term. The benefits will be available 10 - 15 years from the start. But the quickly worsening situation calls for prompt steps.

If the project is accepted in principle, an estimate of wood requirements and a detailed planting plan must be made.

## 3.3

Pistachio-project

The ecological map of Badakhshan shows that a great part of the Province is ecologically suitable for pistachia. However, a great part of this s.c. pistachia forest has been destroyed by people cutting these trees and bushes for fuel.

Pistachio nuts have been collected and exported for industrial use. Afghanistan has a ready market for these nuts.

It is recommended that pistachio is planted on the slopes of mountains. Often it would be the only way to utilize these steep slopes.

There is a plan "Improvement of Pistachio Production, AFG/74/017". This plan may need some detailed work by a pistachio expert before it could be included in the Development Plan.

## 3.4

Silkworm-project

For thousands of years mulberry trees have been used as a medium to produce silk. The larvae of the silkmoth eat the leaves of mulberry trees and produce natural silk. Mulberry trees are very common in many villages in Badakhshan, especially in Jurm.

It would be advisable to have an expert to investigate whether silk production is possible in the circumstances in Badakhshan.

## 4.

## SUPPLY OF TIMBER IN AFGHANISTAN

The suggestion has been made to grow timber in Badakhshan for the whole country. It is therefore necessary to consider this possibility.

## 4.1

Present forest resources in Afghanistan

The forests in Afghanistan are located in the eastern part of the country in the provinces Paktia, Nangahar, Laghmar and Kunar.

Total forest area (including scrub and brushland and degraded forest) is about 700 000 ha.

Some surveys and inventories of these forests have been carried out.

## 4.1.1

## Paktia

| Type of forest    | Area<br>1000 ha | Volume<br>1000 m <sup>3</sup> |
|-------------------|-----------------|-------------------------------|
| Closed forest     | 20              | 900                           |
| Degraded forest   | 165             | 900                           |
| Protection forest | 5               | 330                           |
| Scrub forest      | 210             | -                             |
| Total             | 400             | 2 130                         |

(Inventory by German mission 1968/69)

## 4.1.2

## Nangahar

This is a protected forest. The area is not known but the volume is given as 170 000 m<sup>3</sup>.

## 4.1.3

## Kunar

About 72 % or 152 000 ha of the natural coniferous and oak forests in Afghanistan are located in the Kunar Province. The altitude of these forests is 2 000 - 3 400 m.

The most common species are:

- Deodar (*Cedrus deodora*) 67 %
- White pine (*Pinus excelsa*)
- Spruce (*Picea Morinda*)
- Fir (*Abies webbiana*)

All these species produce medium to high grade saw logs.

The richest coniferous forests may have a merchantable wood volume of 600 m<sup>3</sup>/ha, the average being 150 m<sup>3</sup>/ha

Total standing stock is estimated to be about 25 million m<sup>3</sup>.

In addition there are 198 000 ha of forest land of commercial value for fuel wood, charcoal and specially wood products. These are composed largely of three species of oak:

- Green oak (*Quercus dilatata*)
- White oak (*Quercus incana*)
- Brown oak (*Quercus semicarpifolia*)

Greater part of the Kunar forests are over-mature. The exploitation of these rich forests is only beginning.  
(USAID 1965 and FAO 1974)

## 4.1.4

## Man-made forests

In the middle of the 1960s an area of 800 ha was covered with poplar plantations.

## 4.1.5

## Wood consumption and supply

Traditionally wood consumption per capita is very low in Afghanistan. This is only natural because in the greatest part of the country trees are non-existent. No reliable figures for consumption are available.

It has been estimated that the natural forests of the Eastern Provinces and especially those of Kunar can supply all timber for the whole Afghanistan for years to come when the utilization of these forests is properly organized.

It is important also to take care of the reforestation of these forest areas after cutting.

## 4.2

The possibilities in Badakhshan

At the moment Badakhshan is more or less self-supporting in wood.

Climatic conditions in Badakhshan are unfavourable to tree growing. Annual rain rate is below 250 mm, and the rains are very unevenly distributed during the year. A long period without any rain at all is a serious drawback.

Ecologically a great part of the Province is in alpine and sub-alpine altitude, where no trees are growing. The rest is divided between pistachio- and juniperus -type of vegetation. This shows what kind of trees can be grown on dry land in Badakhshan. As producers of timber these species are completely useless.

On irrigated land, or where groundwater is near to the surface, a great many species of wood can, of course be grown.

Along the roads by irrigation ditches and near houses e.g. the following species now grow:

- Poplar (*Populus* spp.)
- Silver poplar (*Populus alba*)
- Willow (*Salix wallichiana*)
- Plane (*Plantanus orientalis*)
- Mulberry (*Morus nigra*)
- Walnut (*Juglans regia*)

But, as said before, irrigated land area is in short supply and cannot be used for tree growing, except to the extent, which is now necessary in order to produce building poles.

Irrigated land area is a bottle neck for agricultural production in Badakhshan. In such a case the maximum utilization must be searched for the limiting factor of production.

The productivity for land area per hectare is much more in cereal cultivation than in tree growing in the circumstances prevailing in Badakhshan. And in any case all possible irrigated land must be used for grain cultivation in order to feed the rapidly growing population in the future.

Maybe when the road conditions are improved in the future the present poplar plantations can also be changed back to cereal cultivation and building poles brought more economically from Kunar.

The idea of growing timber in Badakhshan is not realistic considering climatic and other circumstances. Forest should be grown where natural conditions for that are favourable.

## CROP PRODUCTION

0.

### INTRODUCTION

The economy of Afghanistan is mainly based on agriculture. It is estimated in various reports that 75 - 80 % of the population is engaged in crop production and animal husbandry. The share of agricultural commodities in exports is still higher. Agriculture-based industries and services included 80 - 85 % of the population depends agriculture. In 1967 the total agricultural population living in Badakhshan amounted to about 400 000.

In comparison with the country as a whole livestock raising is of greater importance due to the large proportion of heavy mountainous area and annual rainfall, which is suitable for pastures. Thus the significance of crop production in Badakhshan may be relatively lower than in Afghanistan generally.

The main crops are cereals, traditionally summer and winter wheat, barley, corn, linseed, sesame, millet and, at lower altitudes rice. Potatoes, turnips and vegetables such as onions, tomatoes, carrots and peppers are grown, but not commonly. Fruit trees are a speciality of the province: apples, pears, apricots, cherries, almonds, walnuts, peaches and pomegranates are grown, mainly in the Zardew, Baharak and Jurm areas.

Opium poppy cultivation has been prohibited in Afghanistan since 1973. The major part of poppy cultivation was on irrigated land. Proposals have been made to substitute crops; farmers claim that the loss of opium income has lowered the general standard of living of certain communities by at least 30 %. However, some other factors may also have lead to a lowering in the standard of living. The cutting of pistachio and wild fruit trees for fuel purposes may have resulted in fruit and nut production losses. The overgrazing of diminished grasslands has further reduced the livestock carrying capacity of the remaining range.

1.

### ECOLOGICAL CONDITIONS FOR CROP PRODUCTION

The physiography, climate and geology of the Badakhshan province are discussed on pages 38 to 49 and 77 to 91.

1.1

#### Influence of physiography on crop production

The lowest point of Badakhshan lies 656 metres above sea level (Yavez). A shore area in Amu Darya valley lies in central Wakhan at 2727 metres. Most cultivated land is found between these levels. The Zone with the maximum diversity of cultivated plants lies at an elevation of 1500-2000 metres (Vavilov & Bukinich).

## HANDICRAFTS AND SMALL SCALE INDUSTRIES

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## HANDICRAFTS AND SMALL SCALE INDUSTRIES

### 1.

INTRODUCTION This report is based on the following sources of information.

1.1 The expert travelled to Badakhshan between the dates October 30 and November 4th, 1975. He then visited the cities of Faizabad and Keshem. A detailed list of activities studied and Handicrafts Units visited is attached to this report as Appendix No. 1

1.2 An Analysis of products on sale in the bazaars in Faizabad and Keshem. In this Analysis, the Manager of Hotel No. 1 in Faizabad was a great help to the expert. As a result of this Analysis, the expert made a list of samples of products made in Badakhshan Province. This list is attached as Appendix No. 2.

This Analysis cannot, of course, be thorough inventory of Badakhshan products, but it gives a view of the present level and development potential of Handicrafts in this Province.

1.3 The expert had discussions with several Government Officers and foreign experts working in Afghanistan. In addition, he paid a series of visits to industrial enterprises and co-operative centres. A list of these contacts and visits is attached as Appendix No. 3.

1.4 The expert became acquainted with reports written by Afghan Government Officers and foreign experts, concerning the Badakhshan Province or similar problems in other parts of Afghanistan. A list of these reports is attached as Appendix No. 4.

### 2.

#### THE NATIONAL ORGANIZATION OF HANDICRAFTS

##### 2.1

##### Industries

Industrial firms, small and large, are reporting to and controlled by the Ministry of Mines and Industries, Division Industries. The Government-owned firms have mainly the function of production units, while administrative and monetary functions are carried out by the Ministry.

##### 2.2

##### Handicrafts

Quite recently a Handicraft Promotion Centre has been established in Kabul. This centre will report to the Ministry of Commerce, Division Export Promotion.

## 2.3

Co-operative Movement

For the time being, the co-operative movement reports to the Ministry of Agriculture and Irrigation, because there are only agricultural co-operatives in Afghanistan. The first handicrafts co-operative has been organized in Estalif, but, through lack of an advisor, it is still not working.

In the Kabul Province, 90 per cent of the farmers have been organized in co-operatives. The basic co-operatives are guided and assisted by area co-operative centres. These centres report to the Kabul Province Co-operative Headquarters in Badam Bag.

At present the governmental organization concerning co-operatives is undergoing a change. When this change has been carried out, the co-operative movement will report to the Rural Development Department, Prime Minister's Office. (Later in this report, referred to as RDD)

According to a plan carried out by the RDD, four additional regional co-operative headquarters are to be established in the near future, one of these in Badakhshan.

The main problem of the RDD, when carrying out this plan, is lack of skilled personnel willing to move to the planned centres.

## 2.4

Financing

The RDD has funds available for the financing of its activities in the Government budget, and, in addition funds from the World Bank and other foreign sources, through the Rural Development Bank.

## 3.

## THE PRESENT SITUATION

## 3.1

Raw materials

## 3.1.1

## Leather

The skin production in Badakhshan clearly exceeds local consumption. Skins are now exported from the province both as live animals and as raw skins.

In addition, animals form a good source of supply of raw materials for leather industries.

The quality of the skins is mainly poor because of animal diseases and incorrect handling and preparing of the skins.

Thus, part of the skins are useless and the rest fall in the lowest price classes.

### 3.1.2 Wool

The local production of wool is apparently greater than local consumption. When thinking about handicraft promotion, a more careful survey of the quantity of wool produced is hardly necessary. But, as in the case with leather, the wool in Badakhshan also suffers from incorrect handling.

Lack of proper sorting, washing, carding and spinning again causes price falls of the woollen products.

### 3.1.3 Silk

There is a remarkable potential for silk growing in Badakhshan, but so far, this potential has not been used.

### 3.1.4 Cotton

There has been considerable cotton production in Badakhshan, but, in recent years, the quantity of cotton produced locally has diminished.

For the time being, the yarn used in cotton weaving is imported mainly from Pakistan or other parts of Afghanistan.

In any case, locally produced cotton would be a very suitable raw material for Handicrafts.

### 3.1.5 Fruits

Badakhshan is famous for its fruit, especially apples and pears. These fruits could be a suitable raw material for canning or drying, but, unfortunately, there is no knowledge of the annual fruit yield.

### 3.1.6 Meat

According to information obtained in Badakhshan, some sheep are exported to Kabul Area by nomad salesmen. This means that sheep production exceeds local consumption, at least at the present level. More exact statistics are not available. In this connection, also the sheep of the nomads should be kept in mind.

### 3.1.7 Wood

The local forest resources apparently cannot meet the local demand for wood as building and heating material. That means, that wood or substitute materials should be imported to Badakhshan to improve the basic living conditions. In the long term, it may be possible to use the Badakhshan Walnut trees as raw material, but for the time being walnuts are a more important export article than the tree. In the long term, the quantity of forests could and should be improved by plantation.

## 3.1.8

## Other raw materials

In addition to those raw materials mentioned above, there is clay suitable for pottery and burned bricks, medical plants which are used for traditional medicins, and Lapis Lazuli mineral.

## 3.2

Products

A list of locally made products is attached as Appendix No. 2.

These products are made mainly for local use, so the designs and quality also only try to meet local demands.

Only products which could be marketable outside Badakhshan are mentioned in the following.

## 3.2.1

## Carpets

There is a workshop for knotted carpets in Faizabad, where boys from various parts of Badakhshan learn carpet making in practise. These carpets seem to be properly made, but, because of the incorrect preparation of the wool, and because handspun yarn is used for both warp and weft and also for the knots, the carpets are quite rough and heavy (up to 3,5 kgs. per square metre).

## 3.2.2

## Knitted woollen products

The knitted woollen products seen in Badakhshan have mainly very pretty designs. Handspun yarn seems to be suitable for this kind of handicrafts. The weak point is the lack of colours.

## 3.2.3

## Leather products

Mainly harness, belts and traditional shoes are made of leather. The harness especially are colourful and decorated.

## 3.2.4

## Cotton cloths

Colourful home-made cotton cloth (alazar) was on sale in the bazaars. The yarn is now imported from Pakistan, but could be replaced by Afghan cotton. The cloth is unfinished and therefore not easy to sell outside Badakhshan.

## 3.2.5

## Namat carpets

Felt carpets called Namat are made of waste wool, and therefore important for the wool production economy as a whole. According to an expert in carpet sales whom the writer met in Kabul, these carpets would be very easy to sell in Europe, if the traditional size, quality and designs are maintained. The Namats seen in Badakhshan seemed to be of traditional design.

## 3.3

Skills

The skills and methods are mostly traditional but could be used as a basis for training in more modern techniques.

## 3.3.1

## Metal works

As a basis for economic development, the skills in metal works are of utmost importance.

The blacksmiths in the bazaars make simple tools like axes, hammers, small agricultural implements, and horseshoes. Welding and cutting techniques seem to be mainly unknown.

Some household articles and traditional ploughs are made of cast iron, but this method can hardly be used when quality requirements increase.

The skills of the silver smiths seemed to be quite good. As a test, the writer ordered two fishing lures at a silver-smith's shop using a factory-made lure as model, and the result was amazingly good.

The quality of the work done by the copper smiths was not as good as that of the silver smiths. This could partly be due to the quality of raw material (probably worn out articles).

## 3.3.2

## Leather works

In tanning, the traditional smoking method is used. For the local market, the result of this tanning is acceptable. For export purpose, this method does not give a good enough quality.

The shoemaker's skills vary enormously, but the best quality of work performed is quite exportable.

The harness-makers skills seem to be of the highest standard, probably because riders are proud to have a good horse with a beautiful harness.

## 3.3.3

## Textiles

The skills of the people doing textile handicrafts seemed to be at a high level. As mentioned, the main problem is lack of knowledge in handling and preparing the wool.

## 3.3.4

## Wood working

The most under-developed handicrafts skill in Badakhshan seemed to be the wood working methods, probably because of lack of raw material, and, therefore, tradition.

## 3.3.5

## Pottery

The skill to make pottery in the traditional way seems to be good. The final quality of the products, however, is not the best

possible, because of lack of heating material, and so the burning temperature is not high enough.

### 3.4

#### Equipment

In all fields of handicrafts, the equipment is traditional. That means, that a total absence of modern tools, machines and other equipment must be one of the main obstacles to economic development.

### 3.5

#### Marketing

Because of the isolated location of Badakhshan the marketing organization is poorly developed. Local bazaars are the places where people buy and sell; particularly there, the enemy of poor people is the salesman.

The marketing system is described in more detail in report No. 10 Appendix No. 4 to this report, vol. III, V - 7.

The most important defect is that there is no economically acceptable marketing channel from Badakhshan to the rest of Afghanistan and the existing channels to Pakistan are illegal and difficult to control.

### 3.6

#### Organization

Because of lack of time, the writer had no possibility to get an idea of how people in Badakhshan have organized themselves.

On the basis of reports of other experts and some personal contacts, the only working organization seems to be the family based one. That means, in practice, that no tradition of co-operation between people belonging to different families can exist. When considering development programs and their implementation, this must be carefully kept in mind.

## 4.

### ASPECTS OF DEVELOPMENT NEEDS AND POTENTIALS

#### 4.1

##### Raw materials

##### 4.1.1

##### Leather

The main reasons for the poor quality of leather are:

- Animal diseases
- Improper shearing
- Improper skinning
- Improper salting
- Traditional tanning

The measures to be taken are

- Dipping and vaccination of the animals
- Chearing to be performed by an expert with modern equipment (the Australian method)
- Skinning to be done by an expert at a modern slaughterhouse to be built in the centre of Badakhshan (Faizabad or Baharaq)
- The tranning to be done by a modern tannery, e.g. Kabul Shoe and Leather Factory
- The leather raw material needed by local handicrafts to be transported back to the centre of Badakhshan where the shoemakers and harness makers could buy it

#### 4.1.2

##### Wool

The main reasons for the poor quality are

- Improper sorting
- Improper washing
- Improper oiling
- Improper carding (now combed)
- Improper spinning
- Lack of colouring

The measures to be taken are:

- The shearing expert should buy the wool from the sheep owner and pay for the raw wool with properly prepared and coloured wool and/or yarn.
- A wool preparing plant should be built in the centre of Badakhshan, where the sorting, washing, oiling, colouring and carding processes could be performed
- Part of the wool should be sent to a modern spinning factory for spinning, and, part of the yarn should be transported back to the centre and be sold to the handicraft makers.
- The women should be trained in the use of a spinning wheel and equipped with these wheels, so part of the wool could be spun locally.
- For knitted products, also the traditional spinning method can be used.

#### 4.1.3

##### Cotton

The following measures could be taken

- People who are willing to do this kind of work should be equipped with hand looms which could be made

locally according to a model loom located in the handicrafts centre, where some training could also take place

- The warp yarn should be spun and potentially coloured at a modern spinning factory and resold to the handicrafts makers against their products
- The weft yarn should be spun locally by the traditional method
- The readymade cloths should be sent to a modern textile mill for finishing and potential printing. The mill could then export the cloths.

This kind of co-operation has already been established between the Bagrami Textile Mill and handicrafts makers in the Nuristan Province.

#### 4.1.4

##### Meat

In connection with the establishment of a slaughterhouse, a refrigerated store house should also be build.

For meat transportation, the centre should also be equipped with refrigerated trucks.

Meat canning could be considered over the longer term, if big enough quantities of suitable meat are available.

#### 4.1.5

##### Other raw materials

The production of other raw materials such as silk, fruit and wood should be promoted by the Agricultural Development Section of the Centre on a long-term basis.

#### 4.2

##### Products

In addition to the improvement of traditional handicrafts products, the following types of new products should be developed at the centre and implemented in Badakhshan.

- Water pumps
- Water power wheels
- Hansoms
- Ploughs and other small agricultural implements
- Well rings, tubes and elements for water containers made from concrete

The full programme with prototypes can be seen at the Handicrafts Promotion Centre in Gardez (Paktia) financed and organized by German bilateral aid.

#### 4.3 Skills

The most important skills to be developed in Badakhshan are those in agriculture and animal husbandry. Otherwise, the improvement of the quality of the raw materials cannot be achieved.

Secondly, the metal work skills should be improved so that the products mentioned under 4.2 could be produced locally.

#### 4.4 Equipment

A series of basic metal working machines should be installed at the Centre, and, of course, a set of tools should be available there.

A service and repair station for vehicles should also be connected to the centre. As large a part of the remaining equipment and tools as possible should be constructed so that it is possible to make them locally (in the Bazaars).

#### 4.5 Marketing

As a first step, the Handicrafts Promotion Centre in Kabul should send its representative to Badakhshan and buy samples of Badakhshan-made products. These samples should be displayed at the Centre.

At the same time, this representative could inform the people in Badakhshan of his plan to come back to Badakhshan, say, six months later to buy more of their products. This should be repeated at least twice a year.

This program should be informed to the people by the word of mouth method. Also schools could be used as information channels.

The Handicrafts Promotion Centre could then sell a part of the products locally in Kabul, and, potentially, export the other part. Later on, when a Handicrafts Promotion Centre has been established in Badakhshan, the function of the representative of the Promotion Centre in Kabul could be transferred to the Handicrafts Promotion Centre in Badakhshan.

#### 4.6 Organization

Agricultural and handicrafts co-operatives should be formed in Badakhshan, first in the central areas, and then enlarging the organization step by step. When organizing the co-operatives, it should be borne in mind, that the traditional family-oriented organization is very strong. The writer believes, that good results through co-operatives can be achieved only if the organization of the co-operatives is adapted to the traditional organizations.

In practice this means that the people should organize themselves and elect their leaders. Only the advisors should be appointed by governmental organizations.

In fields lying above the said 2727 m, winter and summer wheat, winter rye, persian clover, opium poppy, apricot, flax, forage alfalfa, beans, peas and barley are reported to have been cultivated. Limiting heights for the cultivation of the most common crops do not exist in most Badakhshan fields. The central Asian winter climate is a more restricting factor.

## 1.2

### Influence of climate on crop production

The summer climate of the western and central parts of the province is warm continental and dry to semi-arid mediterranean, with the dry season starting in May. Night frosts do not occur during four months, during three months in the Wakhan area. Agro-climatologically the western part of the province is of the cotton type. A little rice is grown on irrigated fields, and double cropping is possible. Short-growing-season wheat qualities and potatoes (Sarda, Garma qualities are most common in Afghanistan, SAIDY & AFZALI) are grown in the east.

## 1.3

### Soils

The cultivated area in the Badakhshan province is reported to be 113 000 hectares (1967 census). The 73 000 hectares fallow area is not included in this figure. The major part of the 3 500 square kilometres of impediment area consists of rocks and 55 - 75 per cent inclined pasture land in the mountain range. The soil condition information obtained for neighbouring provinces such as Takhar, may be applied with reservations to Badakhshan at this stage, since conditions differ from those in Takhar and Kunduz mainly in the smaller size of the valleys and the absence of the great plains.

The corresponding three broad soil groups directly relating to the three physiographic units of the land and the three cropping patterns identified can be distinguished.

#### I Dry-farmed aeolian soil

Hill and mountain soil closely resembles the Esan Top silt loams, which are reported to be brown to dark brown in colour, deep and well drained and deposited by wind. They possess a silt loam texture, which does not vary greatly from a depth of 1 metre. The infiltration rate is high, about 20 cm/an hour. The bulk density (undisturbed) is 1.2 - 1.4 and the pore space about 55 % ideally half occupied by microsores 75 - 1000 y. micrometers. The soils are slightly sticky and plastic when wet, but highly erodible. The topography and infiltration rate are factors restricting the relative suitability for irrigated farming. Soils are moderate to strong alkaline and strongly calcareous, tending to increase with depth. Soils are non-saline, with a water suspension (paste) electric conductance of less than 0,1 mmho. Calcium and magnesium

The co-operatives should then elect their representatives to the board of the central organization of Badakhshan co-operatives. This central organization should have a Promotion Centre to execute the practical work.

5.

#### PRELIMINARY PRIORITY OF MEASURES TO BE TAKEN

As a first step, marketing promotion according to 4.5 above should be organized. This requires only one man with a car (a small lorry might be suitable) and working capital for the Export Promotion Centre.

When thinking of the priority of the following measures to be taken the writer thinks leather is the most important raw material available in Badakhshan. The leather industry in Afghanistan is short of good raw material, and there is a good export market for leather products.

Priority given to the various programmes could therefore be as follows:

1. Marketing according to 4.5
2. Formation of co-operatives organization
  - 2.1 Animal Husbandry Advisory Centre
    - 2.1.1 Dipping and vaccination of animals
    - 2.1.2 Advisory work and training
3. Slaughter house
4. Refrigerated store and truckes for transport
5. Leather Handicrafts Promotion Centre
  - 5.1 Organization and financing of the leather business
  - 5.2 Advisory work and training
6. Shearing expert and equipment
7. Wool preparing mill and Promotion Centre
  - 7.1 Organization and financing of the wool and cotton business
  - 7.2 Sort, wash, oil, colour and card the wool
  - 7.3 Advisory work and training
8. Agricultural Advisory Centre
  - 8.1 Advisory work, soil tests etc.
  - 8.2 Implementation of better methods and agricultural implements

9. Metal-working Handicrafts Promotion Centre
- 9.1 Advisory work and training
- 9.2 Organization and financing of the metal business
- 9.3 Establishment of a workshop equipped with basic machines and tools
- 9.4 Storing of spare parts
- 9.5 Service and repair station for vehicles
- 9.6 New Products Development

In addition, as soon as possible, the primary schools should enlarge their teaching programme to contain the following fields

1. Animal diseases, dipping, vaccination
2. Proper shearing and shearing methods
3. Principles of co-operative movement

The production of well rings, tubes and elements of concrete should be started according to the needs of the water supply development programme.

The promotion of the production of silk, cotton, medical plants, wood, fruits, walnuts, cumin etc. should be one of the responsibilities of the Agricultural Promotion Centre. This centre should also organize the marketing of these products.

## 6. CAPITAL INVESTMENT NEEDED

According to information obtained from the German experts in Paktia, the total capital requirement to be invested in the proposed programme would be about 50 million Afs. (US\$ 1 million)

This programme could be implemented step by step over a period of five years, so the budget would roughly be as follows

|          |                 |                  |
|----------|-----------------|------------------|
| 1st year | 5 million Afs.  | (100 000 US\$)   |
| 2nd year | 15 million Afs. | (240 000 US\$)   |
| 3rd year | 10 million Afs. | (220 000 US\$)   |
| 4th year | 10 million Afs. | (220 000 US\$)   |
| 5th year | 10 million Afs. | (220 000 US\$)   |
| Total    | 50 million Afs. | (1 000 000 US\$) |

The current expenses have not been calculated by the writer because a more detailed plan is needed before this calculation is possible.

In any case, later on at least, part of the current expenses may be covered by the sales income of the various Handicraft Promotion Centres.

## 7. RECOMMENDATIONS FOR ADDITIONAL SURVEYS

- 7.1                      Feasibility study concerning the wool preparation plant. The other alternative would be some existing wool factory and transports.
- 7.2                      Feasibility study concerning the refrigerated store house and refrigerated trucks.

## 8. CONCLUSION

Because the people in Badakhshan live in an emergency situation, the writer recommends that, if possible, the entire proposed programme should be implemented as soon as possible. If only parts of this programme are implemented, the economic development of Badakhshan will still be delayed and backwardness will only increase.

A long range, also the establishment of sub-centres of the proposed Development Centre in other regions within Badakhshan should be considered.

## APPENDIX NO. 1

Activities Studied and Handicraft Units Visited

1. The Carpet Workshop and Training Centre in Faizabad
2. A Traditional Tannery in Faizabad
3. A Woodworking Workshop in Faizabad
4. A cast iron Workshop in Faizabad
5. The Slaughter House in Faizabad
6. The Bazaars in Faizabad
7. A pottery Workshop in Keshem
8. A saw mill in Keshem
9. The Bazaars in Keshem

## APPENDIX NO. 2

List of Samples of Products made in Badakhshan

1.

Knitted Carpets in Faizabad

|                  |                                                                                                                          |
|------------------|--------------------------------------------------------------------------------------------------------------------------|
| Quality :        | Heavy, 3,5 kgs per sq.m.<br>16 to 25 knots per sq.cm.                                                                    |
| Salary paid:     | 700 Afs. per sq.m.                                                                                                       |
| Problems:        | Quality of yarn, raw material<br>- Shearing of the knots<br>- Professional diseases caused by the raw material (allergy) |
| Price in Keshem: | 2 000 - 3 000 Afs. per sq.m.                                                                                             |

2.

Leather Products

2.1

Shoes

|                   |                                                                           |
|-------------------|---------------------------------------------------------------------------|
| Design:           | traditional                                                               |
| Quality:          | varying, poor to good                                                     |
| Price in bazaars: | 140 to 200 Afs. per pair                                                  |
| Problems:         | No knowledge of demands of outside markets<br>- high cost of raw material |

2.2

Harness, Belts

|           |                         |
|-----------|-------------------------|
| Design:   | traditional, colourful  |
| Quality:  | good to excellent       |
| Price:    | a belt, prima, 100 Afs. |
| Problems: | only local market       |

3.  
Textiles
- |          |                                                                                                                                                                                                                                                |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Design:  | traditional or adopted                                                                                                                                                                                                                         |
| Quality: | good but lack of finishing                                                                                                                                                                                                                     |
| Prices:  | big neck cloth knitted, 140 Afs.<br>alazar-cloth, 40cm x 950 cm, 400 grams, 100 Afs.<br>carpets of cotton, 12 sq.m., 2 000 Afs.<br>faithcall-cap, 60 to 100 Afs<br>overcoat, woollen, 100 Afs.<br>namat, carpet of waste wool, 3 sq.m. 650 Afs |
4.  
Pottery
- |           |                                      |
|-----------|--------------------------------------|
| Design:   | traditional                          |
| Quality:  | good but unfinished                  |
| Price:    | bowl 10 litres 20 Afs.               |
| Problems: | Lack of heating material and colours |
5.  
Cast Iron
- |          |                                        |
|----------|----------------------------------------|
| Design:  | traditional or adopted                 |
| Quality: | poor                                   |
| Price:   | kettle abt. 50 - 80 litres, 2 200 Afs. |
6.  
Copper Products
- |           |                            |
|-----------|----------------------------|
| Design:   | traditional                |
| Quality:  | poor                       |
| Price:    | 300 Afs per one kilogramme |
| Problems: | raw materials, methods     |
7.  
Molded Sheet Iron Products
- |           |                               |
|-----------|-------------------------------|
| Design:   | adopted but not most economic |
| Quality:  | good                          |
| Problems: | imported raw material         |
8.  
Wooden Products
- |           |                                            |
|-----------|--------------------------------------------|
| Design:   | according to local needs                   |
| Quality:  | poor                                       |
| Problems: | lack of raw material, skills and equipment |

## APPENDIX NO. 3

List of persons met and organizations visited:

|                                  |                                                                                    |
|----------------------------------|------------------------------------------------------------------------------------|
| Mr. M. Alam Rechnou              | General Director, Social Affairs<br>Ministry of Planning                           |
| Mr. Hussaini                     | Officer in Charge of Education<br>Ministry of Planning                             |
| Mr. M. Farid Rafiq               | President, Export Promotion<br>Ministry of Commerce                                |
| Mr. Prokoviev                    | International Marketing Advisor<br>Handicrafts I. T. C.                            |
| Eng. Mir M. Seddiq               | Presicent, Rural Development Dep.<br>Prime Ministers Office                        |
| Mr. Sakhi                        | Vice President, Rural Development<br>Dep.                                          |
| Mr. Maran                        | Director of Programming<br>Rural Development Department                            |
| Mr. Sayed Yaqub                  | Assistant Director<br>Co-operative Head Quarters<br>Badam Bag                      |
| Mr. Fatah                        | Director, Kodahmen Co-operatived<br>Handicraft Centre, Estalif<br>Charikar Tannery |
| Mr. Lotz                         | Director of Metal Work Shop<br>Handicraft Development Centre<br>Gardez             |
| Mr. Warburton                    | Marketing Consultant,<br>I. L. O. Management Centre                                |
| The Manager                      | Omid Textile Mill                                                                  |
| The Manager                      | Bagrami Textil Mill                                                                |
| The Manager                      | Kabul Shoe and Leather Factory                                                     |
| The Assistant Tannery<br>Manager | Kabul Shoe and Leather Factory                                                     |

## APPENDIX NO. 4

## SELECTED REFERENCES

- |     |                                                    |                                                                                                                  |
|-----|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1.  | SA-29a                                             | Current Economic Position and Prospects of Afghanistan                                                           |
| 2.  | Prime Minister's Office<br>Rural Development Dept. | Reconnaissance Survey of Badakhshan Province for Rural Development Programmes                                    |
| 3.  | ILO/TAP                                            | Handicrafts and small-scale industries, 1954                                                                     |
| 4.  | ILO/TAP                                            | Development of handicrafts and small-scale industries in general and cotton and silk weaving in Particular, 1959 |
| 5.  | ILO/TAP/AFG/R. 3                                   | Small scale leather industries, the leather projects of Charicar and training in leather technology, 1971        |
| 6.  | FAO/TA 2702                                        | Improvement of Karakul sheep husbandry, 1969                                                                     |
| 7.  | FAO/195                                            | Small Agricultural Implements and Farm Tools, 1953                                                               |
| 8.  | ILO.TAP/AFG/R.12                                   | Promotion and Development of co-operatives                                                                       |
| 9.  | ILO/AFG/71/004                                     | Management Development, Afghanistan Management Consultancy                                                       |
| 10. | 7060/UNICEF/CINAM                                  | Services for Children within Regional Development Zones, 1973                                                    |
| 11. | AFG/74/011                                         | Socie-Economic Survey for the Development of Badakhshan, 1974                                                    |

## WATER AND POWER DEVELOPMENT

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## WATER AND POWER DEVELOPMENT

### 1. ORGANIZATION AND ADMINISTRATION

The Central Authority of Water Supply and Sewage is responsible for urban water supply and sewage systems in Afghanistan. In water supply matters the entire Badakhshan Province has been considered to be a rural area. No water supply or sewage projects have been carried out there by this authority. The Rural Development Department (RDD) is responsible for water supply development in the rural areas. The office is quite new and no water supply projects has been carried out by it. Up to now RDD has no staff in Badakhshan working in water supply sector.

The power supply sector is under the control of the Water and Power Authority of the Ministry of Mines and Industries. This office has no staff in Badakhshan, either.

### 2. THE AVAILABLE WATER RESOURCES

A part of the annual precipitation evaporates from the surface of the ground, plants, lakes and rivers into the air. Depending on the topographical, geological and climatic characteristics of the area, the rest of the water either flows into the lakes and rivers, becomes stocked as snow and ice on the ground or absorbed into the soil as ground water. The ground water forms springs, which then discharge as surface water to lakes and rivers. The water resources of an area are dependent on all these developments in the circulation of water in nature.

#### 2.1 Meteorological Observations

There has been one station of the Meteorological Institute of Afghanistan at Faizabad Airport with regular meteorological observations since the year 1963. Five more stations in Eshkashem, Seghanan, Darwaz, Kwahan and Keshem have started operation after 1970, but no reliable statistical data is available at present. The stations are shown in the Appendix 1.

Data on temperature and precipitation in Faizabad are shown in the tables 1, 2. As indicated in the tables, the average annual temperature at the Faizabad Airport is about  $13,4^{\circ}\text{C}$  in July, which is the warmest month, the average temperature is  $26,6^{\circ}\text{C}$  and in January, which is the coldest month  $-0,6^{\circ}\text{C}$ . The extremes measured are correspondingly  $+38,0^{\circ}\text{C}$  and  $-9,3^{\circ}\text{C}$ .

The average annual precipitation in Faizabad is about 490 mm. The main part, about 72 % of this, tends to fall during February, March, April and May. Less rainy, about 24 % of the total, are October, November, December and January. June, July, August and September are almost rainless representing about 4 % of the total. Variations during an individual year are great. According to statistics (1964-74) the highest annual precipitation measured in Faizabad has been 702,9 mm (1965) and the lowest only 289,7 mm (1971). The latter resulted in heavy losses in agriculture and caused famine in the area.

No evaporation measurements have been made in Badakhshan and theoretical calculations have not been undertaken in this context either.

Because the relative altitude varies between 650 - 7 485 m in the Badakhshan area, it is only natural that the climate also varies according to scale.

The highest points in the Wakhan and other mountain areas are covered with eternal snow and ice, and at the same time it is possible to get two harvests annually e.g. in the Keshem area if irrigation is used.

## 2.2

### Ground Water Resources

The ground water resources of the Badakhshan area have not been surveyed in detail. A hydrogeological map of Afghanistan has been prepared in scale 1 : 200 000 in connection with the UN Special Fund Project "Establishment of Water Management Department Afghanistan". An extract of this map is presented in Appendix 2. The map gives only general information on ground water resources of the area.

Furthermore, UNICEF-expert, hydrogeologist S. Radojicic has prepared a report in 1974, on "Rural Water Supply Project, Hydrogeological Survey in Badakhshan Province". This report covers 38 villages in the Province and gives the reader a good picture of ground water resources from the point of view of drinking water supply and how the rural water supply in the Province can be developed.

The geological characteristics of the area have been described in the sectoral report "GEOLOGY". This report deals with hydrogeological issues related to water supply possibilities.

Recent loose deposits occur mainly along river and stream valleys and also to some extent in topographic depressions, in other words in the areas with the most dense population. As these deposits in

are dominating exchange ions, potash low, cation exchange capacity low in lack of humus clay fractions. A hardpan may be caused by carbonate containing fertilizers or water. Soils are inherently nonfertile, but properly managed have a high agricultural potential. To absorb the annual 500 mm precipitation a layer of about 3 metres is needed. With half of this, a good crop may theoretically be produced.

## II The topographically higher, irrigated, well-drained terraces

The upper valley soils consist of alluvial and irrigated soils with a wide range of texture. The topsoil may be silt loam, subsoils loam, silt loam, silty clay loam or silty clay surface often half covered by stones. The particle size limits may vary between 10 - 40 % clay fraction, 50 - 85 % silt and less than 20 % sand fraction. For example the Kunduz silt loam, incline 0 - 1 %, is well drained, dark greyish-brown soil of the higher areas adjacent to the escarpment of the Esan Top group I soils. The infiltration rate is low and morphology is not influenced by groundwater. Soils are non-saline, medium to strongly alkaline, strongly calcareous, with a low exchange capacity, most of the other fertility factors resemble those of group I. Peaty layers like Nr 40, Malarghi silt loams may occur in subsoil in the eastern range of the Warduj Valley (Zebak) and where the temperature is never very high and moisture stays moderate (marsh).

## III Irrigated and waterlogged alluvial plain

This group consists of lower valley soils, which are moist, mottled or gleyed, waterlogged for long periods and poorly drained and suitable for growing rice. These soils are rare in Badakhshan, but some irrigated areas may formerly have been of this category.

### 1.4

#### Natural vegetation and effect of grazing

At the time of the visit in late October little vegetation was left on the fields or pastures. The last sheep flocks of the nomads were moving westwards.

On locations saved for grazing, certain observations could be made. Only a few well yielding species were seen. In some places, good pasture qualities such as clover (*Trifolium*), fescue (*Festuca*) and cocksfoot (*Dactylis*) were seen. In irrigated gardens good grazing vegetation occurred the majority consisting of natural grasses. If the foothills and slopes, now hardly distinguishable at a distance from poughland, were formerly, about 30 years

most cases are unconsolidated, the porevolume of the coarse-grained material is high, and thus richly saturated with ground water at locations where these deposits extend under the natural ground water level. Furthermore, the permeability of these soil types is low and thus the water flows fast. Even though the volumes of the individual deposits are not large a sufficient amount of water for domestic use is available because the main rivers and streams carry water around the year. Also when a stream dries up some ground water discharge under the stream bed usually exists. It is also worth mentioning that even though e.g. in Wakhan area all small tributaries are completely frozen up in winter, the ground water in these deposits is in liquid form and can thus be used for water supply.

These formations are suitable for construction of shallow dug wells. If these wells are well protected, a sufficient amount of hygienically satisfactory drinking water may be supplied in most cases for people and live-stock in the small villages.

In the highland areas where the loose material is often fine grained and the topography steep, only a small part of the precipitation will be absorbed into the ground. Furthermore, the ground water level is often at such a depth that shallow dug wells cannot be used. The ground water occurrence in the bedrock is a far more complicated problem than ground water in the recent deposits. Generally speaking the geological formations in the Badakhshan area have such a composition that they practically lack groundwater, because of a very low pore volume.

Ground water in bedrock occurs mainly in zones where the rock is strongly jointed, fractured and faulted. Normally such locations are difficult to discover only by visual inspection as they are covered with loose material. These formations are suitable for deep well drilling and can be used for water supply in areas where other suitable water sources are not available.

Springs occur at several locations along steep hill slopes, mainly in zones where the rock is strongly fractured and faulted. The discharges of separate springs vary to a large extent, but they are usually small. The spring discharges reported in the UNICEF Report vary from 0,03 L/S to 2 L/S the mean discharge being some 0,5 L/S. Springs with such a low discharge can be used for drinking water supply for small villages, but not e.g. for irrigation purposes. If the location of a spring is suitable it can be tapped and the water can be conducted by a gravity fed pipeline to the point of consumption.

Very limited information about the quality of the ground water is available. Samples taken from springs have been reported to be chemically good.

Bacteriological analyses have not been carried out. In the western part of the Province there is a very complex pliocen formation composed e.g. of gypsum and salt. The ground water in these formations differs in quality often being rather mineralized. Generally speaking the quality of ground water in Badakhshan is mainly good and in most cases it sets no limitations on water supply.

## 2.3

### Surface Water Resources

All rivers of Badakhshan Province belong to the Amu Darya Basin. The biggest one is Darya-i-Panj, the main branch of Amu Darya. This river forms the border of the U.S.S.R. and it originates from the high mountain area of Wakhan and Pamir. The other big river is the Darya-i-Kokcha originating from the northeastern slopes of Hindu Kush. Its main tributaries are Darya-i-Warduj, Darya-i-Zardew and the Machad Darya. Two small lakes, Kole Shewa and Zor Kol, are also in Darya-i-Panj basin.

The Hydrological Department of Afghanistan maintains six hydrological stations in the rivers of the Badakhshan area, where the heights and discharges of water are measured. The code numbers and locations of the stations are shown in the map appendix . All these stations have gone into operation after 1970. Due to certain difficulties in the operation of these stations reliable observation series are available only from stations No. 152 and 155. This information is presented in the table All data collected during the years 1974 - 75 are presently in the Kunduz Office and have not yet been analyzed.

As indicated in the tables, the rivers have abundant water even in summer and autumn, when there is no rainfall in the area. This is because the snow and ice in the mountain area melt all the year round. The small tributaries with a low catchment area tend to dry up during the dry seasons. Correspondingly the small tributaries with high catchment area are completely frozen up during the winter due to the very low temperature.

The overflow season tends to begin in the end of May and lasts about three months. Due to the fact that the climatic conditions - and thus the snow melting time - vary so much in the Badakhshan area, the overflow in the main rivers is quite hampered. For example in Darya-i-Warduj near Baharak the maximum discharge is only about five times the mean discharge and correspondingly the mean discharge only about six times the minimum discharge. In the streams with a small catchment area the variations are much bigger.

As a general fact it is worth noting that the minimum discharges of Darya-i-Panj, Darya-i-Kokcha and their tributaries are always sufficient for all water supply and irrigation purposes in the area. The rivers provide good also possibilities to develop the hydroelectric power.

### 3. WATER SUPPLY

#### 3.1

##### Present Situation

There are no public water supplies in the Badakhshan Province. No successful shallow wells have been constructed. One spring is tapped for the Faizabad Hotel. The Governor's Residence has piped water supply system, as well.

Most people in Badakhshan obtain their water from springs, streams, rivers and irrigation canals. During rainy periods water is available near every village. During dry periods some small streams and springs dry up and water must be carried from long distances.

In Wakhan and other highland areas, where the streams freeze to the bottom during the winter the people have to melt snow and ice to get drinking water. Taking into consideration the severe situation in obtaining firewood the water supply problems are worst just in this area.

Dependent on the origin of the in-take place, the water is of poor suspect or satisfactory quality for domestic use.

From the chemical point of view the quality of the water is usually satisfactory or at least tolerable. During the overflow time, when surface runoff exists, the quality usually weakens sharply. The worst problem in water supply is the bacteriological pollution of the water intake places. Particularly the irrigation canals, which run slowly through the villages, are used for washing and animal drinking; in some cases even as sewage ditch. This kind of water is always polluted. A spring may be quite a safe source for drinking water supply. Usually, however, both people and animals use the same spring. Particularly in cases when the discharge is low there is a real risk for pollution. Streams, rivers and other surface waters run through many villages and settled areas and they can never be quite safe for the drinking water supply.

The use of polluted water results in many diseases, such as typhus, cholera, dysentery and some other intestinal diseases which are spread via water. In discussions with the local health care staff, it was clearly expressed that dysentery is particularly common in Badakhshan.

## 3.2

Development Strategies and Proposals

The main problem of the drinking water supply in Badakhshan is the bacteriological pollution of the present water intake places. Another problem is the lack of water within reasonable reach in many villages, particularly during the dry periods or in winter time. In this report the main long term objective in water supply is considered to be the provision of every citizen with hygienically faultless water within a reasonable reach. This task imposes very great demands, because at the moment there is no organized water supply in Badakhshan Province. There is not even a trained staff working in this sector.

According to the present situation and existing possibilities the main principles in developing the water supply in Badakhshan are as follows:

- Priority should be given to those projects where benefit per capita is at its greatest compared with the required investments.
- Priority is given to those projects which are technically simple and do not require either high operation and maintenance costs or highly trained staff for construction and operation.
- Priority is given to those projects where the share of manpower is big and which can mainly be realized by the people themselves.
- Water supply has to strengthen the development efforts in other economical and social sectors so that priority is given to the water supply of hospitals, health centres and schools.

Raw water resources to be utilized should meet the quality standards set for satisfactory drinking water. The ground water generally best meets these requirements. Surface water resources should be taken into use only if suitable ground water resources cannot be found in the area. In these cases it is suggested as the minimum treatment to infiltrate water into the stream bed and then collect it by using perforated pipes or shallow dug wells.

Because of the lack of electricity most water supplies should, where pumping is needed, be equipped with diesel-driven pumps. Operation and maintenance of this equipment are more difficult than that of electric pumps. In most cases even fuel supply causes big difficulties. Therefore, pumped water supply systems should be avoided as long as electric power and working main-

tenance organization are not available. Such systems should be planned for the centres of the districts and large villages only if e.g. the gravity systems are not possible.

In the first phase the investments in water supply development have to be concentrated in shallow well construction and spring tapping. In both cases the costs per capita are low, the system is technically simple and work can be done mainly by the people themselves. In most cases those simple systems fully replace the more complete and expensive ones.

### 3.3

#### Programmes and project proposals

After the dry period in 1971 - 72 UNICEF started in co-operation with the Ministry of Public Health a "Rural Water Supply Work Programme for the Additional Provinces of Badakhshan, Ghor and Oruzgan". The project is financed by the Swiss Government and up to now about 60 water supply schemes, mostly shallow wells with hand pumps, have been constructed in Ghor and Oruzgan Provinces. In 1974 the hydrogeologist, Mr. S Radojicic accompanied by two Afghan water supply experts visited the Badakhshan Province in order to get basic data for this project. During their stay in Badakhshan 38 villages were inspected in total, ten of them in Faizabad area, 6 in Keshem District, eleven in Jurm, five in Eshkashem and six villages in Wakhan District. It was suggested that the water supply in the villages surveyed be organized in the following way:

- by a drainage trench or by a large diameter dug well 6 villages
- by spring tapping 12 "
- by a shallow dug or drilled well, equipped with hand pump 14 "
- by a deep well equipped with power pump 2 "

Thirteen of these projects will be carried out in 1975 and the rest probably in 1977, when the UNICEF programme is supposed to be completed. Through this programme about 90 000 people in Badakhshan Province will be able to take advantage of an organized water supply.

The UNICEF Project covers only 34 of the 621 villages in Badakhshan Province. The villages outside this project are on an average small and most of them are located far from motorable roads. This means, that e.g. deep well drilling in most cases is impossible, because of the difficulties in the transportation of drilling equipment. Also the maintenance of any

technically complicated equipment is impossible in these circumstances. This means that the first priority in the development of the water supply during the next ten years should be given to shallow well construction and spring tapping. The programme may be carried out using the same working method as in the UNICEF Project. The planning work will be done by experts coming from Kabul. They should check the possibilities of supplying water with these simple and cheap systems, village by village. If it is possible, the village is to be taken into the programme, otherwise not.

Handpumps, pipes, ventilators and other such things should be imported to Badakhshan Province. The production of concrete rings for wells and concrete blocks for water reservoirs is to be organized in Badakhshan. A group of "well sinkers" should be trained for supervision of the well construction and spring tapping. Otherwise, the work can be done by the people themselves either as unpaid self-help or in some cases paid in terms of food as is presently done in some road construction works assisted by the World Food Programme.

No plans on how to take care of operation and maintenance of these water supply systems have yet been made. The first systems will be in operation in about half a year. The diesel-engines need regular maintenance. As far as maintenance of hand pumps is concerned the broken and worn-out parts should be regularly replaced by new ones. E.g. the piston sealings should be replaced 3,4 times per year. The minimum staff needed for the maintenance work in the first phase is one trained pump operator. Rapid increase of water works causes growing needs for maintenance and operation staff at the corresponding ratio.

4.

#### POWER SUPPLY

The main internal sources of energy in Afghanistan are hydro-power, coal and natural gas. Also wood and manure bricks are generally used for heating and cooking in the households. All oil is imported in the form of refined products.

Up to date no deposits of oil, gas or coal have been reported in the Badakhshan Province. The closest coal deposits have been discovered in the neighbourhood of Taluqan and the closest natural gas deposits in the neighbourhood of Sheberghan, about 370 km west from Faizabad. The geological bedrock conditions in the Badakhshan area do not give reason to expect discoveries of oil, gas or coal.

The main energy resource in Badakhshan is hydroelectric power. To date, however, it has not been developed at all.

## 4.1

Present Situation

The Faizabad Town is the only place in Badakhshan, where electric power is available. The power is generated by three diesel aggregates with a total output of about 150 kw. The power is only used for lighting during 4 - 5 hours in the evenings. The maximum power requirement is presently about 90 kw.

## 4.2

Energy Resources Available

The electric power needed in Badakhshan can be generated locally or imported from the neighbouring provinces or from the USSR. For local production the use of diesel-aggregates and hydro-power stations is possible. No detailed surveys of the hydro-electric potentials of the main rivers (Darya-i-Kokcha and Darya-i-Panj) of Badakhshan have been carried out but, even cautiously estimated, the total potential is not less than two or three thousands MW.

For large scale hycro-power stations particularly, Darya-i-Kokcha is very suitable. There are large areas, where the rock types are compact and relatively watertight so that only limited grouting is needed in the dam constructions. The river bed is usually deep and narrow and the river slope is steep so that power stations with high fall heights are possible without any massive dam constructions.

The river is also rich in water throughout the year due to the melting snow in the mountains. The greatest difficulties for dam and power station construction will be caused by solid material sedimentation above the dam and by seismic disturbances, which are common in the area. This implies that very high quality engineering know-how is required in the planning phase.

Small scale hydro-power stations (from ten to some hundred kw) can be constructed in small tributaries and in connection with irrigation canals. In most cases the problem is that the discharge of those tributaries is not sufficient throughout the year. However, some very suitable places are available.

One of special interest near Chookaron Village was seen during the field trip.

## 4.3

Development Strategies and Priorities

The possibilities to use electric power give development impulses to all economical and social sectors. This is important especially in Badakhshan, where replacing of electric power is laborious due to the fact that other energy resources and motorable roads

are lacking in the main part of the Province. On the other hand, the construction of an electric transmission line over the rivers and mountains should be quite easy.

Because the average size of the villages in Badakhshan is small and they lie scattered and far from each others and the Province is still very under-developed, the consumption level of energy will be low to come for a long time.

Industries with high energy consumption are also lacking in the area. This means that in most cases long transmission lines are too expensive compared to consumption. The first steps in the electrification should consist of local small-scale hydro-power stations and diesel aggregates, which will be most profitable.

In the first phase electric power should be made available for big villages, hospitals, health centres, schools, administrative offices, small-scale industries, water supply schemes and other public facilities. Particularly some sectors of small-scale industry definitely need electric power to operate.

Mining and large scale irrigation projects possibly to be established in Badakhshan could be the potential large-scale energy consumers in the future.

In the second phase, when energy consumption increases and the capacity of the small-scale power stations is no longer sufficient for the transmission networks of the main centres of Badakhshan should be connected together. The available alternatives in energy supply will be to construct a large-scale hydro-power station in Darya-i-Kokcha or to import energy from the Taluqan direction generated by turbine sets using natural gas. A large-scale hydro-power station, however, is too big a project for Badakhshan Province alone. The main part of the energy generated would be exported to the other provinces of Afghanistan or to the USSR.

In the valley of Darya-i-Panj there are villages which are located far from the main centres of Badakhshan. The road connections to those villages are either lacking or are very poor consisting of tracks only. This area is totally under-developed, which means that the possible energy consumption is very limited. However, it is very important that electric power is made available at least for health centres, schools, administrative offices and other public purposes.

The power demand would be very low from 10 to 30 kW per village. Locally this could be generated by diesel aggregates or small scale hydro-power stations. The costs per kWh would

in both cases be unusually high. The most profitable way to provide the biggest villages of the Darya-i-Panj valley with electric power, is to buy energy from the USSR across the river, where electric power is available. The investment costs in this case are so low that the problem is more political than economical.

#### 4.4

#### Programmes and project proposals

The only power supply project that is considered presently for Badakhshan by the water and power Authority is a small-scale hydro-power station scheme for Fayzabad Town with its neighbourhood. The plan was carried out by an Indian consulting group (Water and Power Development Consultancy Services Limited) and the scheme would be financed by the Indian Government. According to the plan the power station would be placed in the Jozen stream flowing through the town and it would be equipped with 3 x 85 kW turbines and generators. In the planning phase the hydrology of the stream was not studied enough and later on it was observed that the minimum discharge of the stream was much less than what would be needed for the power station. For this season the plan was abandoned.

Instead the water and power authority has suggested a hydro-power station to be constructed in connection with the irrigation canal just under the Faizabad Town. The fall height available will be about 11 m, which means that the discharge through the power station should be 2 - 2,5 m<sup>3</sup>/s to get the needed effect. During the field trip the irrigation canal was partly filled and caused by fine grained sediments carried by the water and in the canal there were big boulders which had rolled down from the slope of the river bank. The capacity of the canal was less than 0,5 m<sup>3</sup>/s. Before a decision is made on this project, the canal should be cleaned and discharge should be measured or estimated so that it would be possible to know if sufficient water for the irrigation and power supply purposes is available. If there is enough water, this project would be very realistic.

The other main centres of the Badakhshan Province which should be electrified in the first phase are Keshem, Baharak and Jurm. In Keshem a diesel aggregate is probably the most profitable solution. In Baharak and Jurm small-scale hydro power stations are also possible. However, before the technical decision is made a feasibility study is needed.

The villages in the valley of Darya-i-Panj, which should be electrified with energy imported from the USSR, are Eshkashem Khandud, Sheghnan, Darwaz and Khwahan.

The electric supply projects proposed in this report are summarized as follows:

- a feasibility study and electrification plans for the following main centres of the Badakhshan Province
- Faizabad
- Keshem
- Baharak
- Jurm

Consultations between the governments of Afghanistan and the USSR about the electrification of the following villages in the valley of Darya-i-Panj.

- Eshkashem
- Khandud
- Sheghnan
- Darwaz
- Khwahan

ago, similar in appearance the whole year round, overgrazing is the main cause of low pasture productivity on natural vegetation terrain.

It is obvious that overgrazing reduces the varieties of natural vegetation, particularly the most eutrophic part, which in good conditions is that part of vegetation with the highest yield. Grazing throughout the snowless period, including the seed-producing period causes a low level of regeneration in annual and perennial plants. In this way, uneconomic users of growth factors are enriched and the grazing capacity reduced to an obviously low level.

A gazetteer of natural vegetation species and types should be made for Badakhshan province. One possibility of doing this would be to let small groups of pharmacy students make detailed reports for small plots as samples of different height botanical composition.

Many reports refer to caraway and other spices growing wild in Badakhshan province to some extent. Most plants have a special, often very strong and distinctive smell. Botanical work would possibly reveal or ascertain valuable species, which could become important cash crops. Cultivation of this kind would be profitable, because products from this distant province should weigh as little as possible per value unit.

## 2.

### PRESENT STRUCTURE OF CROP PRODUCTION

#### 2.1

##### Production of different crops

The different areas under cultivation and the land use pattern are shown in hectares and percent shares in Tables Nos 5 to 8. Land under cultivation including the fallows is most abundant in the northwestern and western divisions or Fayzabad, Darwaz, Keshem and Shahr-i Bozurg. The thinly forested areas, pastures with scattered trees and areas covered with fruit and nut trees excluding fenced poplar plantations are most extensive in the northwestern divisions of Shahr-i-Bozurg and Khwahan. The share of pure pastures is at its highest in Fayzabad, Ragh and in the eastern Eshkashem. The most intensive agricultural areas as far as area under crops and gardening are concerned Khwahan, Keshem, Darwaz and Fayzabad. If a weighing operation is calculated taking a four-double weight for irrigated areas and a 0,5 coefficient for pastures and forests, the most intensive agricultural areas are Wakhan, Darwaz, Keshem and Kerano-Menjan.

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## PUBLIC HEALTH

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## PUBLIC HEALTH

### 1. PRESENT SITUATION

#### 1.1 The health state of the population

No statistics or other exact information of the public health state in Badakhshan are available. The estimations and considerations presented here are given by the local doctors and people. The answers given in different parts of Badakhshan follow the same pattern and for that reason the information can be considered indicative.

The location of the mountainous areas of the Badakhshan highlands results in a comparatively healthy climate with few epidemic and infectious diseases. In general, people seem to be healthy and wellfed. At the moment there exist few nutritional problems and no large epidemics.

The main health risks are

- narcotic drugs in the eastern part of the province, where an estimated amount of 40 000 people use opium continuously
- tuberculosis
- rheumatism
- trachoma
- syphilis cases in eastern parts of the province and ghonorrea in the Keshem area
- childrens' malnutrition because of the lack of protein in their food
- deliveries, at which is the mortality rate is estimated to be around 5 - 10 % in Badakhshan
- acute cases like stomach troubles among poor people apparently resulted by sylvia in the unpurified salt. Appendicitis, influenza, broken bones etc.

The poor accessibility to the majority of villages prevents the possible epidemics from spreading but it also makes it difficult to organize a comprehensive health care system.

## 1.2

The Health Care System

Each health institution can be considered as an independent unit and responsible to the Ministry of Public Health. For co-ordination and control there is the Director of the Public Health Department in Faizabad. At the same time he is the Director of Faizabad Provincial Hospital.

The present health care institutions are shown in the Map (1). There is the central hospital with 30 beds in Faizabad. The hospital is divided into departments for children, surgery and diseases. Furthermore, it has a laboratory and X-ray department. The number of personnel amounts to 25, including three physicians, one dentist, four nurses, four vaccinators and one sanatorian.

In the Malaria Hospital of Faizabad there are no doctors. The patients are few at the moment. The four health centres of Badakhshan are located in Eshkashem, Jurm, Keshem and Darwaz. The average personnel for each health centre is one physician, one sanatorian, two vaccinators and one nurse.

The Eshkashem Health Centre has a subcentre in Zebak. The Jurm Health Centre has its subcentres in Baharak and Khash. The Keshem Health Centre has a subcentre in Jerehusk. The health centre physician usually visits a subcentre once a week. As permanent personnel there are one nurse and two vaccinators in these subcentres. The routine vaccination against smallpox is given. The World Food Programme has a programme for pregnant mothers and children in Badakhshan. Wheat, oil and non-fat dry milk is distributed through the Faizabad Hospital and Keshem health centre to about the 1 000 people.

Despite the official institutions of health care mentioned people have their own traditional treatments for different diseases and most cures and aid are given at home or in the village.

The effectiveness of the health care system is very much reduced by the serious shortage of drugs, antibiotics, asperine etc. Vaccines are sometimes lacking too. The curative means often consist only of rest and warmth at home and seldom can any kind of drugs be administered.

The difficulties in defining the diagnosis are great, because of lack of laboratory and X-ray units in health centres.

Also the lack of transportation facilities leads to a situation where only people living within about five kilometres of a health unit are able to use the services. The vast majority of the population has no opportunity of using the official health service.

For instance, 15 of the 30 beds in the provincial hospital are free all the time because of the lack of patients. This is due to the little help of the modern medicine compared with the traditional means. The transportation problem is another influential factor.

At present the following rough estimates of the health service level in Badakhshan can be given

|                      |   |        |
|----------------------|---|--------|
| population/physician | = | 70 000 |
| population/bed       | = | 15 000 |

In general the health services in Badakhshan are quite well organized, but the resources are very limited.

## 2.

### DEVELOPMENT OBJECTIVES AND GUIDELINES

The main objective in developing the health care system in Badakhshan is to emphasise the improvement in the general health state of the population by the minimum need for new health care resources. This is done by concentrating efforts on the main problems where progress can be made at relatively low costs.

The following goals should be taken into account:

1. To stop the use of narcotic drugs in the wolesvalis of Wakhan and Eshkashem and the alagadaris of Shehnan and Zebak.
2. To eradicate tuberculosis from the province
3. To reduce the rate of maternal and child mortality and help the childrens' nutritional situation
4. By providing the population with safe water to prevent infections and epidemics
5. To give public information in order to prevent trachoma, syphilis, gonorrhea, rheumatism and health troubles caused by unclean salt
6. To organize cures for simple acute cases suffering from trachoma, appendicitis, broken bones etc.

The guidelines for solving the problems of narcotic drugs have been given in the UN/FAO Report (The Control of Narcotic Drugs in Afghanistan).

The immunization, health information, mother and infant care as well as the simple curative services should be given provided by the health centre or subcentre staff or by mobile health service groups which is proposed to establish in the province.

To reach the majority of the people the health centres should be situated at points where the population density is high. They should also be within reach of roads or air traffic to enable good contacts with the subcentres. In this respect the present health centres have good locations.

In locating the subcentres, the same criteria should be used. Also good paths to the nearest villages and suitable roads for mobile team should be emphasised. Pilot studies are recommended in order to organize a village health worker system with "health co-operatives" for drugs and vaccines in the villages of Badakhshan. Reference in this respect is made to the report "A Field Survey of Health Needs, Practices and Resources in Rural Afghanistan".

### 3. DEVELOPMENT PROJECTS

#### 3.1 Control of Narcotic Drugs

Measures to be taken to stop the use of narcotic drugs in Badakhshan have been suggested in the Report "The control of Narcotic Drugs in Afghanistan UN/FAO, 1973".

The solution comprises four stages

1. The drafting and passing of new legislation and regulation in respect of the cultivation and trade of opium
2. The strengthening of the country's law enforcement capacity
3. Measures of assistance to opium producers in "hard core" areas
4. Studies of the extent of drug addiction and the amelioration of related health problems

This report does not deal with all the recommendations given in the report mentioned above. Only two items which affect the health situation of the people in Badakhshan are emphasised here.

(Recommendations concerning e.g. the substitution of opium cultivation by other crops are given in the sectoral report of crop production.

1. To stop the trade between the producers in the Jurm Baharak valley and the consumers in the eastern parts of the province.

The police must be given exact regulations of how to search for poppy cultivations, for instance with the help of air photography, and how to find the opium traders. The police should be adequately provided with four wheel drive vehicles or if necessary a helicopter should be borrowed from the army for the some occasions.

2. The rehabilitation of drug abusers.

The health unit teams in Eshkashem, Zebak, Shehnan and Khandad, of which the two last mentioned are to be established according to this report, should be provided with substitute medicines for use instead of opium and also with mobile groups of rehabilitators which would begin treatment in the villages of the drugs addicts area. During the first six months of activity these groups would also undertake a survey of opium use in order to find out what further steps are required to eliminate opium use.

Each of these rehabilitation groups should consist of three rehabilitators (nurses). For the medicine and additional training needed for the nurses experiences from Iran and Turkey should be made use of. As medicine controlled opium can also be considered.

The costs of this programme can be roughly estimated as

Capital costs:

Housing of the rehabilitators in the health units  
4 x 0,5 mill Afs = 2,0 mill Afs

Recurrent costs:

|                   |                          |
|-------------------|--------------------------|
| 4 jeeps           | = 600 000 Afs/year       |
| 12 rehabilitators | = 240 000 Afs/year       |
|                   | <hr/> 0,84 mill Afs/year |

drugs unestimated

### 3.2

#### Basic Health Centres and Subcentres

The health care system should have four levels:

- the hospitals in Faizabad (no changes are recommended because of the great expenses that would result and because of the lack of use)

- the basic health centres (BHC:s)
- the health subcentres
- the health posts (in the future, as the village health worker system is accepted in Afghanistan)

The institutions of the first three levels are called health units. The base of the system is the basic health centre, which directly serves the inhabitants of its neighbourhood. It also serves the population of the out skirt villages in the same area through its subcentres. With the mobile teams it extends the services even to the remotest villages located in the area it is responsible for.

The tasks of a basic health centre should be:

- health education
- immunization and control of communicable diseases (TB, malaria)
- maternal and child health and child nutrition
- family planning
- in the eastern part of Badakhshan the rehabilitation of narcotic addicts
- in the future, training of the village health workers
- simple curative services and drug distribution

The staff of five persons of a basic health centre in Badakhshan is very small compared to the usual 10 persons in other parts of the country. However, to make the system more effective it is more important to increase the number of health centres and subcentres and give them better transportation facilities, drugs and vaccines than to increase the staffs of the present units. In order to handle the problems of mother and child mortality, new personnel group of auxiliary nurse midwives are needed. Except maternal and child health and child nutrition education the auxiliary nurse midwives shall also give family planning guidance, which is needed from the health point of view of mothers and children.

It is recommended that two new health centres in Shegnan and Shahr-i-Bozurg and additionally six new subcentres be established. The exact location of the subcentres can be decided only after further feasibility studies but the strategy should be as follows:

- one new subcentre for Keshem basic health centre in Pengani direction along the main road. If the main road direction is changed in the highlands the subcentre should be located by the main road in the Bazar Tesrhkar district.
- one new subcentre for Jurm basic health centre in Ashaghan direction

- three new subcentres for Faizabad hospital, one in Dobh direction along the main road, one in Yaftals and one in Khwahan, which would be visited by a doctor once a week by aeroplane. If the aeroplane route is turned in a suitable way Khawhan can be served from Darwaz direction, too. For services Faizabad hospital needs two additional physicians.
- one new subcentre for Eshkashem Basic Health Centre to serve the Wakhan district in a Khandud area.
- when the road from Faizabad to Ragh is completed (see sectoral report Transport ) the 3rd new health centre or the 7th new subcentre of Ragh can be established.

The Keshem, Faizabad, Jurm and Eshkashem centres should be provided with a jeep to be able to serve their subcentres. At the moment there are cars only in Jurm and Faizabad. Each of the health units of Sheghnan, Zebak, Eshkashem and Khandud should be provided with three drug rehabilitators as proposed earlier.

Each health unit should be provided with two auxiliary nurse midwives to help mothers during their pregnancy in the deliveries and in child care, and who also give advice on these problems, including family planning

The personnel of a health centre and a subcentre will consist of:

| <u>Health centre</u>                             | <u>Subcentre</u>                            |
|--------------------------------------------------|---------------------------------------------|
| one physician                                    | (one visiting physician)                    |
| one sanatorian                                   | one nurse                                   |
| two vaccinators                                  | two vaccinators                             |
| one nurse                                        | two auxiliary nurse midwives                |
| two auxiliary nurse midwives                     | (three rehabilitators in Khandud and Zebak) |
| (three rehabilitators in Eshkashem and Sheghnan) |                                             |

The drug stores of the health units in Badakhshan shall be impressively.

There are very few pharmacies in the province and the ordinary people have no possibility to travel to get their drugs elsewhere. It is recommended that the Government provides the Badakhshan health units with the necessary, amount of the most common drugs, for instance antibiotics. The physicians should be advised to order expensive drugs for the use of severe cases only.

## 2.2

Crop marketing

Crop marketing systems are relatively undeveloped in Badakhshan. Most of the food crops are grown for domestic consumption. It is therefore difficult to obtain reliable figures for the total production of the province. As a guide, the 1967 year census results are given in Table 10. The data is not quite complete as field crops are not reported independently, potatoes are included in vegetables and the fruit group consists of both wild and garden fruits.

The total production of cereals was 101 thousand metric tons, on an average 253 kilogrammes per head of agricultural population. Potato cultivation is reported to be expanding rapidly in the east, where improved short-period wheat is also grown.

The Fayzabad grain store exchange figures, where available, do not indicate the total share marketed, but provide good information by means of the annual variation and the need for improved seed.

## 2.3

Marketing channels

There is no cooperative unit operating the grain trade in the Province. In Fayzabad a new large godown for grain store was recently started under the governor's instructions.

Some cotton is grown and taken to the Spinzar factory in Kunduz. Sugar-beet contract growing for the Baghlan mill is common in the neighbouring provinces.

Marketing in or close to the crop-producing areas has not been studied nor reported. The share of annual yields varies considerably.

## 2.4

Crop produce prices

According to an interview from 1974 (RDP) farmers (in the various parts of the province) were paid for their wheat as follows (Afs per 7 kilos):

| Place        | Autumn | Winter | Spring | Summer |
|--------------|--------|--------|--------|--------|
| Wakhan       | 30     | 40     | 60     | 50     |
| Eshkashem    | 35     | 45     | 45     | 40     |
| Keshem       | 35     | 40     | 45     | 40     |
| Sheghnan     | 40     | 50     | 60     | 70     |
| Baharak      | 40     | 45     | 50     | 50     |
| Keranomenjan | 50     | 50     | 100    | 100    |
| Pamirat      | 60     | 80     | 100    | 100    |

A regular annual rate is indicated for:

Jurm, Urgo and Drime 40-50

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